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THE THROAT AND NOSE

AND THEIR DISEASES,

BEING

A FIFTH, REVISED, AND EXPANDED EDITION

OF

THE THROAT AND ITS DISEASES;

WITH

ILLUSTRATIONS BY THE AUTHOR

THE

THROAT AND NOSE

AND THEIR DISEASES.

WITH FIVE HUNDRED AND FIFTY ILLUSTRATIONS IN COLOUR,
MOSTLY DESIGNED AND EXECUTED

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TO THE

COMMITTEE AND MEDICAL STAFF

OF THE

CENTRAL LONDON THROAT AND EAR HOSPITAL

IN GRATEFUL RECOGNITION OF GENEROUS SUPPORT

AND CORDIAL CO-OPERATION IN ATTAINMENT OF THE EXPERIENCE

ON WHICH ITS TEACHINGS ARE BASED

51187

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DATES OF THE VARIOUS EDITIONS

First Edition	*May* 1878
Second Edition	*June* 1887
Third Edition	*May* 1890
Translated into French . .	*March* 1891
Fourth Edition	*June* 1893
Fifth Edition	*October* 1898

PREFACE TO THE FIFTH EDITION

FEW words are needed to introduce the Fifth Edition of a work which first appeared upwards of twenty years ago.

My old teacher, Professor Syme, was accustomed to say that, as a result of increased experience, each fresh edition of a surgical work should be condensed rather than extended. This is, however, difficult with any medical treatise of the present day, and almost impossible in respect to a subject in which there is continuous active research.

Hence, despite free condensation in some directions, even to the extent of omissions—as for instance in the chapters on Aural Maladies—the present work has largely grown with each new issue.

This increase is due not only to the almost daily expansion of laryngology, but also to the inclusion in its territory of the equally widening fields of rhinology.

The changes and additions are such that, as compared with even the Fourth Edition, the present one is practically a new work, as may be gathered from the following details:—

1. The information on the Anatomy and Physiology has been brought up to the most recent knowledge, and an entirely new feature is that of Normal Histology.

2. As a corollary, the Morbid Anatomy, gross and microscopic, has demanded equal attention and detailed illustration.

3. A new chapter on Bacteriology, as applied to diseases of the Throat and Nose, has been added.

4. The prominence given to these features of Pathology and Bacteriology has necessitated an almost entire re-writing of the sections relating to Tonsillitis and Diphtheria, and to greater

extension of those on Tuberculosis, Lupus, Leprosy, and Malignant Neoplasms.

5. For parallel reasons, the chapter on Nervous Diseases of the Larynx has been re-written.

6. Separate chapters are now accorded to Diseases of the Lingual tonsil, of the Pharyngeal tonsil, and of the Accessory Nasal Cavities, subjects only briefly treated in previous issues.

In thus devoting closer attention to what may be called the more Scientific aspect of the subject, every endeavour has been made to in no way narrow its Clinical and Practical characters, which constituted the avowed purpose of the book when it first appeared: in proof thereof, it may be mentioned that the illustrative cases, which numbered less than one hundred and fifty in the last edition, have been increased to upwards of two hundred in the present. In every direction the details of treatment have been correspondingly extended.

It may be permitted to draw attention to yet another new feature:—Recognition has been given to the circumstance, eloquently dwelt upon by an eminent statesman on a recent occasion, that each separate science is so rapidly accumulating facts that further specialisation is necessarily and inevitably set up in every one of them.

By the liberality of my publishers, I have been enabled to avail myself of the services of qualified collaborators in some of these specialised branches, and their contributions will speak for themselves. I must, however, particularise the services of my colleague, Mr. Wyatt Wingrave, who is responsible for the details of morbid anatomy, and has afforded equally valuable information in regard to the higher anatomy and histology of the normal. These contributions are enhanced by a large number of original preparations, all of them from material derived from my private practice or from the hospital in which we are both associated. Beyond this it is a pleasurable duty to acknowledge his assistance in the revision of each chapter of the Book, as it has passed through the press.

Valuable help has also been accorded by Messrs. Nourse, Abercrombie, and Thorne, the present Registrars of the Hospital, in the preparation of the Index. The care with which these

gentlemen and their predecessors have kept the records of the patients has enabled me to increase the number as well as the value of the clinical observations.

The reasons which have been given for extension of the text of this Treatise have applied with equal force to the Illustrations. Those occurring in the letterpress, which numbered in the Fourth Edition two hundred and thirty, are now increased to upwards of four hundred, and they are printed in colour. The Chromo-lithographic figures are also increased.

The microscopical illustrations have been drawn direct from the sections of Mr. Wingrave, with fidelity and appreciation, by Miss Gertrude Potter, a science student. The clinical pictures are, as in former editions, drawn by myself. The whole have been faithfully reproduced by the process of direct photo-engraving, under the superintendence of Mr. Carl Hentschel. The chromo-lithographic plates of former editions have been redrawn; several new ones are added; and in relation to all of them I am much indebted to the artistic staff of my printers, Messrs. Morrison & Gibb of Edinburgh.

15 MANSFIELD STREET,
PORTLAND PLACE, W.,
October 1, 1898.

DISEASES OF THE THROAT AND NOSE

CORRIGENDUM ON PAGE 348.

For Fig. 23 *read* Fig. 36.
For Fig. 32 *read* Fig. 35.

tumours in the mediastina and of lesions of the brain and medulla, the laryngeal condition thus revealed in the mirror may at a very early period enable us to form a diagnosis and prognosis, which without such knowledge would be often erroneous, or at least doubtful.

It is long since Von Ziemssen proposed, and Elsberg insisted, that courses on laryngoscopy and laryngological technics, as well as other methods of diagnostic and therapeutical procedures, should *precede* attendance on general clinical instruction, the argument being based on correct appreciation of the fact that, unless the student is already in possession of the technical ability required, the mere looking on the performances, or listening to the words, of the best clinical teacher is comparatively valueless for his own doings in practice. Until some change in this direction is effected, by the recognition from Examining Boards of the equal importance of laryngology and rhinology with ophthalmology, practical skill in these branches must be confined to the minority of students conscientiously desirous to equip themselves at all points for their lifelong battle with disease, and to those who, made conscious of their deficiencies only after their entrance into practice, endeavour, by post-graduate courses, to acquire that information and facility which was considered of secondary importance in their curriculum.

In the hope of supplying this want—so far, at least, as written pages can substitute personal instruction—this book was written.

Clinical study, as the name implies, can only be efficiently

pursued in the presence of the patient; but I have endeavoured to frame a work which, in its bearings, is intended to be essentially clinical.

Attention is mainly directed to the diagnosis and treatment of those diseases of the throat which have been brought more prominently into view since the introduction of the laryngoscope.

But the strong reflected light necessary for laryngoscopy has aided in more accurate observation of diseases of the fauces and pharynx; and the rhinoscope, a corollary of the laryngeal mirror, has been of similar service in reference to disorders of the naso-pharyngeal and nasal passages. Equal consideration is therefore given to the various morbid conditions of these regions.

The chapter on Deafness in relation to Affections of the Throat and Nose, introduced in the second edition, is retained; and albeit not greatly amplified in this later one, I venture to deprecate the criticism that because of its brevity it might be omitted; for although perhaps not much more is comprised than an enumeration of the aural maladies dependent on morbid conditions of the throat and nose, with but general indications for treatment, the whole book emphasises the close association of these regions, and consequently the importance of a thorough aural examination, in all cases in which coincidental aural phenomena are presented to the throat specialist.

With the intention of avoiding unnecessary repetition, the earlier chapters are written with such method and detail as to make them a key to the rest of the work. In order, then, that the later portions may be well understood, it is essential that the preliminary chapters be carefully studied, and their lessons thoroughly mastered, with the aid of frequent examinations of the healthy throat and larynx: diligence and perseverance being as necessary in this direction as they are for a perfect knowledge of healthy chest-sounds as revealed by the stethoscope, or of the normal fundus of the eye by the ophthalmoscope. The student may further perfect himself by adopting one of the methods of auto-laryngoscopy.

In this edition the section on Regional Anatomy and Physiology, which is much fuller than in any of the former issues, is placed first. This position does not interfere with the continuity of the work, and the contents may be perused or 'skipped,' according to the inclination or state of knowledge of the reader.

The chapters on Semeiology and General Therapeutics are also given very fully; and unless these be attentively considered, the importance of the references to differential symptomatology

and treatment of the various diseases, later considered under their separate headings, cannot be appreciated.

From a desire not to unnecessarily increase the bulk of the work, or to destroy its practical character, I omitted in the first edition 'questions of purely pathological interest.' This want has already to some extent been supplied in later issues; and a further new departure is taken in the present edition. In the first place, by a chapter on the General Bacteriology of Diseases of the Throat and Nose; and, secondly, by entrusting the revision of certain special sections to specially qualified fellow-workers.

In the separate discussion of each form of disease, the arrangement of signs, symptoms, and methods of treatment adopted in the introductory chapters is as far as possible followed. I am aware that such a plan is open to certain objections, and may sometimes cramp the flow of description; but the advantages to the busy practitioner of a uniform method for purposes of reference and comparison have appeared to me to offer ample compensation.

Histories of cases in detail were for the most part excluded from the first edition. This rule has been gradually modified, and without intention to make the volume a mere transcript of my note-book, short accounts of cases are given wherever their narration is thought likely to elucidate points of pathology, diagnosis, or practice. In addition, all the drawings of diseased appearances, whether in the text or in the coloured plates, are accompanied by explanatory notes bearing on the nature of the cases illustrated.

Pictorial illustrations of disease as seen with the mirror are believed to be essential to any work intended as a practical guide. The illustrations of this work have all been taken from nature by myself. The coloured plates representing my own drawings have been placed afresh on the stone, and many new ones are added. In the first plate, illustrative of the normal laryngeal image, every variety and form of healthy larynx is figured; but afterwards, in those displaying diseased conditions, only those points which are departures from the normal are indicated; and, as intended to represent *types* of disease, the drawings have in a few instances been somewhat conventionalised—that is to say, accidental differences of protraiture have, for the sake of simplicity, been omitted.

The coloured illustrations are arranged with especial regard to more convenient reference than is usually possible. Each plate can be opened out so as to lie beside the book during

perusal of the whole of the chapter descriptive of the disease pictorially illustrated; and this course is recommended.

References to these coloured illustrations are made thus: (Fig. 12, PLATE II.); to all engravings in the text thus: (Fig. CII.).

Many new engravings appear in the text; a large number of histological drawings from original sections, as well as representative types of bacteriological products, have been also added.

The illustrations of instruments have been carefully revised, and, except occasionally for purposes of comparison, only those found of value in my own practice are figured. They are generally drawn to scale, so as to be available as working drawings. The majority of the instruments described have been made for me, according to my patterns, by Messrs. Mayer and Meltzer, to whom, as well as to other makers, I am much indebted for carrying out and perfecting several of my crude suggestions as to new instruments and improvements. Without the mechanical and practical skill of such firms, the so-called inventions of many of us would prove of but slight utility when tested in the consulting-room or operating theatre.

Care has been exercised to give the names of all to whom credit is accorded for originality, as well as of those from whom I may differ on points of theory and practice, and any omission in either of these directions is accidental. With a view, however, of ensuring greater comfort of perusal, the luxury of foot-notes or intercalated references is dispensed with.

It will be observed that I quote very largely from the writings of my American confrères. No excuse is needed for this procedure, because from no quarter have we derived, in these later days, so many original observations and suggestions of real practical value as from the members of the American Laryngological Association and kindred societies in the States.

I gratefully acknowledge also the assistance I have gained from the bibliographical records of the (British) *Journal of Laryngology*.

One word more—to avoid reiteratiom, it is to be noted that allusion to 'colleagues' refers always to my co-workers on the surgical staff of the Central London Throat and Ear Hospital, who, in addition to a willingness at all times to give me assistance in my own work, have, with rare liberality and unanimity, always placed at my disposal any cases of unusual interest occurring in their own practice.

Lastly, a full list of formulæ of remedies is appended, reference being made to it in the text by numerals corresponding to those affixed to the referred formula.

CHAPTER I

ANATOMY, HISTOLOGY, AND PHYSIOLOGY OF THE LARYNX

REVISED BY MAYO COLLIER

THE MINUTE ANATOMY CONTRIBUTED BY WYATT WINGRAVE

ALTHOUGH it is beyond the scope of this work to discuss with complete detail the anatomy and physiology of the upper respiratory passages, a full general description of their several structures and uses is essential to a right comprehension of the laryngoscopic image, in health and in disease. Of still more importance is an accurate knowledge of the minute anatomy, in other words the normal histology, of these regions; for only on such a foundation can the morbid deviations be appreciated. And since the pathological aspects of diseases of the throat and nose are increasingly receiving the attention they deserve, the exclusion of these particulars would no longer be consistent with the aim of this volume.

THE LARYNX, or organ of voice, is usually described as a box composed of cartilages which are connected by ligaments and membranes, and acted upon by various muscles; but in point of fact it is a box without floor, and with a lid always more or less open; and to take a broad view, the larynx, whatever its outer gross resemblance, may be better likened, so far as its interior is concerned, to an hour-glass, the constriction corresponding with the glottic chink. This simile is, however, again lacking in completeness, for whereas the sand aperture of the hour-glass remains constantly and equally patent, the laryngeal opening for passage of air and for production of voice is ever variable.

The larynx is situated at the upper and fore part of the neck, where it can be seen and felt, subcutaneously, as a considerable prominence in the middle line. It is suspended from the hyoid bone, and lies behind and below the root of the tongue, and between the deep carotid vessels.

Its mucous membrane is continuous with that of the pharynx

and mouth, and extends downwards as the lining of the trachea and bronchi.

Surface Markings.—The hyoid bone, the central prominence of the thyroid cartilage, or *pomum Adami*, as well as the cricoid, can always be discerned, even in the fattest persons. On a level with the lower jaw and immediately below the mid-line, can be felt the body of the hyoid bone; this can be traced horizontally backwards towards the vertebral column, to end in the greater cornua.

Below, and in the middle line, there is a distinct depression, corresponding to the central thyro-hyoid ligaments; and this usually marks also the apex of the epiglottis.

Lower than this again is the prominence of the thyroid cartilage, which varies in size, being more apparent in males than in females, in the old than in the young, and in the spare than in the obese. In the subcutaneous cellular tissue, just in front of the anterior thyro-hyoid ligament and pomum Adami, is a large bursa, so placed to facilitate movements of the larynx. Below the pomum, the median ridge of the thyroid cartilage can be indistinctly made out; and, on a yet lower plane and still in the mid-line, the depression corresponding to the crico-thyroid membrane and the prominence of the cricoid cartilage —one of the most valuable landmarks of the neck—can be felt.

The upper limit of the crico-thyroid membrane indicates the level of the rima glottidis, the narrowest part of the respiratory tract. The cricoid cartilage, in the normal position of the head, corresponds with the fifth cervical vertebra. This also indicates the point where the omo-hyoid crosses the common carotid artery, the lowest limit of the larynx, the commencement of the trachea, and the narrowest part of the œsophagus. Lastly, its upper border corresponds with the point of entrance into the larynx of the inferior laryngeal vessels and nerves.

On each side of the thyroid and cricoid cartilages, one can recognise the lateral lobes of the thyroid gland, partly obscured by the cervical fascia, and by the sterno-hyoid and thyroid muscles.

The thyroid gland, which is bound to the laryngeal cartilages and trachea by strong attachments, rises and falls with the larynx in deglutition—a fact of some assistance when a distinction has to be drawn between a bronchocele and other tumours in this region.

The trachea can be felt in the mid-line below the prominence of the cricoid cartilage. The extent of it which is to be felt in the neck, in the normal position of the head, is not more than 1½ to 2 inches in length, and corresponds to about seven

or eight rings of the trachea. The upper two rings of the trachea are immediately subcutaneous, but those on a level with the upper margin of the sternum are 1½ to 2 inches from the surface. On extreme extension of the head and neck, about an inch more of the trachea can be felt, and the tube is rendered more prominent, a point of some importance in regard to the operation of tracheotomy. The second, third, and fourth rings of the trachea are more or less covered by the isthmus of the thyroid gland. A large plexus of veins is constantly found in this position.

FIG. I.—SIDE VIEW OF THE LARYNX.

1. Prominence of thyroid cartilage (Pomum Adami).
2. Cricoid cartilage.
3, 4. Upper border of cricoid.
5, 6. Lower border of cricoid.
7. Thyroid cartilage.
8, 9. Superior cornua of thyroid.
10. Right inferior cornua of thyroid.
11. Articulation of the thyroid with the cricoid.
12. Crico-thyroid aperture.
13. Epiglottis. 14. Trachea.

In shape the voice-box, as viewed externally, is irregularly pyramidal, the apex being in front, the base behind.

The skeleton of the larynx is constructed of nine separate parts, viz. four cartilages, the thyroid (Fig. I. 7), cricoid (Fig. I. 2), and two arytenoids (Fig. III. 1 and 2); one principal fibro-cartilage, the epiglottis (Fig. I. 13), and four smaller fibro-cartilages, those of Wrisberg (Fig. VI. 11 and 12) and of Santorini (Fig. VI. 9 and 10), two of each. These last are of little practical importance, being, as it were, merely supplementary to the

arytenoids. Luschka further describes as occasionally present one inter-arytenoid cartilage; and as more frequently existing, two pairs of small cartilages, the anterior and posterior sesamoid (Fig. XII. 11 and 12, page 25). The four first-named cartilages —thyroid, cricoid, and arytenoid—are liable to ossification as the result of age or disease, but the epiglottis and other fibro-cartilages never undergo this process. The cartilages, large and small, are connected by ligaments, and by articulations which admit of a variety of movements.

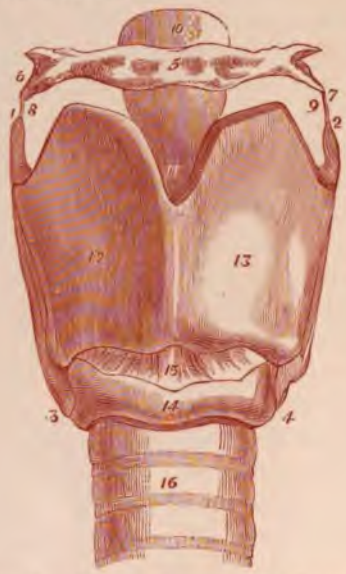


FIG. II.—FRONT VIEW OF THE LARYNX.

1, 2. Superior cornua of thyroid.
3, 4. Inferior cornua of thyroid.
5. Hyoid bone.
6, 7. Cornua of hyoid bone.
8, 9. Thyro-hyoid ligaments.
10, 11. Epiglottis.
12, 13. Alæ of thyroid cartilage.
14. Cricoid cartilage.
15. Crico-thyroid membrane.
16. Trachea.

The **Thyroid cartilage** (*θυρεὸς*, a shield) is the largest of the laryngeal cartilages (Fig. I. 7, and Fig. II. 12 and 13), and is well named the shield of the voice-box, containing and protecting, as it does, the essential parts of the vocal organ—the vocal cords.

Latterly C. Ludwig has called it the 'Stretching' cartilage, because the tension of the vocal cords is dependent on the lever-like movements of the thyroid cartilage. It is composed of two alæ or wings, united anteriorly at a sharp angle by a centrepiece, the *lamina mediana cartilaginis thyroideæ* (Fig. I. 1), which is found at every age and in both sexes. The vocal cords (Fig. III. 6, 3,

3), as well as the thyro-arytenoidei interni muscles, are attached to this median lamina. The wings of the thyroid (Fig. II. 12, 13), expanding outwards and backwards, form the two lateral walls of the larynx. Their superior horns or cornua (Fig. II. 1, 2) are connected with the hyoid bone (Fig. II. 5) by the thyro-hyoid ligaments; and the thyro-hyoid membrane, extending between the cornua and the hyoid bone, serves to still more closely connect these two structures. The epiglottis (Fig. II. 10, 11) is attached by its stalk to the dorsal aspect of the thyroid cartilage

FIG. III.—SIDE VIEW OF THE LARYNX, SHOWING THE INTERIOR, THE RIGHT PLATE OF THE THYROID BEING REMOVED.

1, 2. Arytenoid cartilages.
3, 3. Processi vocales of the arytenoids.
4. Processus musculus of the right arytenoid.
5. Upper border of cricoid.
6, 3, 3. Vocal cords.
7. Facet for articulation of the thyroid with the cricoid.
8. Left plate of the thyroid.
9. Left superior cornu of thyroid.
10. Cricoid cartilage.
11. Trachea.

in the receding angle and just below the median notch; while inferiorly the thyroid and cricoid cartilages are connected by that most important structure, the crico-thyroid membrane (Fig. II. 15). The inferior cornua of the thyroid are further united to the cricoid by capsular ligaments lined with synovial membrane (Fig. II. 3, 4); while the vocal cords, and the thyro-arytenoid muscles (Fig. IV. 1, 2, 3, 4), constitute the bond of junction between the thyroid cartilage and the arytenoids.

The **Cricoid cartilage** (Fig. III. 10) receives its name from its ring-like form (κρίκος, a ring). Ludwig calls it the 'Foundation'

cartilage, because upon it is built, as it were, the whole framework of the larynx. As we have seen, the thyroid rests upon it by its inferior cornua (Fig. II. 3, 4), and on it rotate the arytenoid cartilages (Fig. III. 1, 2). The cricoid may also be considered as the capital of the column of the trachea, with which it is connected by fibrous tissue (Fig. I. 5, 6). It is narrow, in a vertical direction anteriorly, but broad and deep behind. Continuing the comparison to a signet ring, the part corresponding to the seal is thus seen to be placed posteriorly. The lower rim of the cartilage (Fig. I. 5, 6) is nearly horizontal in position, but its upper margin

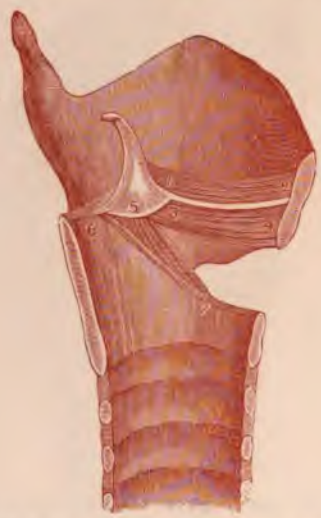


FIG. IV.—SIDE VIEW OF THE LARYNX, SHOWING THE INTERIOR OF THE LEFT HALF.

1, 2, 3, 4. Left vocal cord and the thyro-arytenoideus muscle.
5. Left arytenoid cartilage.
6, 7. Cricoid cartilage.
5, 7. Crico-arytenoideus lateralis muscle.

(Fig. I. 3, 4), from the greater depth of the posterior part, inclines from before upwards and backwards. The posterior part of the cricoid, the *lamina cartilaginis cricoidæ*, is hexagonal in shape, neither the sides nor the angles, however, being exactly similar, although the two halves are symmetrical. In the median line behind and internally is an elevated ridge which separates two slight depressions for the insertion of the posterior crico-arytenoid muscles, and serves for the attachment of the œsophageal aponeurosis. Owing to its construction anteriorly, a gap is formed between this part of the cartilage and the thyroid which is filled in, as already stated, by the crico-thyroid membrane

(Fig. II. 15). On its posterior and superior aspects it presents two broad saddle-shaped articular facets for the reception of the bases of the arytenoid cartilages.

The **Arytenoid cartilages** (Fig. III. 1 and 2), two in number, are pyramidal in shape, their apices pointing upwards and inwards, and when joined together they bear a fanciful resemblance to a pitcher (*αρυταινα*). Situated at the back of the larynx, they articulate by their bases, which are concave from before back-

FIG. V.—SIDE VIEW OF THE LARYNX, SHOWING THE LEFT VENTRICLE OF MORGAGNI AND THE LEFT ARY-EPIGLOTTIC LIGAMENT.

1, 2. Left vocal cord.
3. Elevation indicating the site of the left cartilage of Santorini.
4, 5, 2, 1. Entrance to left ventricle of Morgagni.
4, 5. Left ventricular band (false vocal cord).
6. Elevation indicating the site of the left cartilage of Wrisberg, with the cuneiform cartilage running down to 4.
7. Aryteno-epiglottidean (ary-epiglottic) ligament.
8. Arytenoid muscle.

wards, with the articular facets already described, on the upper and posterior part of the cricoid (Fig. III. 4). Ludwig calls the arytenoids the 'Regulating' cartilages, because on their position depends the shape of the chink of the glottis. The base of the arytenoid, by means of which it articulates with the cricoid, is prolonged into two distinct processes. One, the posterior or external (Fig. III. 4), has the shape of a hook, and gives attachment to the lateral and posterior crico-arytenoid muscles.

Luschka calls it accordingly the *processus musculo-articularis.* The anterior angle of the bases of the arytenoids—the *processus vocalis* —is a projection, the point of which may be perceived with the laryngoscope as a yellow spot visible through the mucous membrane of the vocal cords to which this process gives attachment. The arytenoid cartilages are connected at their apices with the epiglottis by means of the ary-epiglottic folds (Fig. VI. 11, 13, and 12, 14), and with the thyroid (in addition to the bond of union afforded by the vocal cords) by the thyro-arytenoid liga-

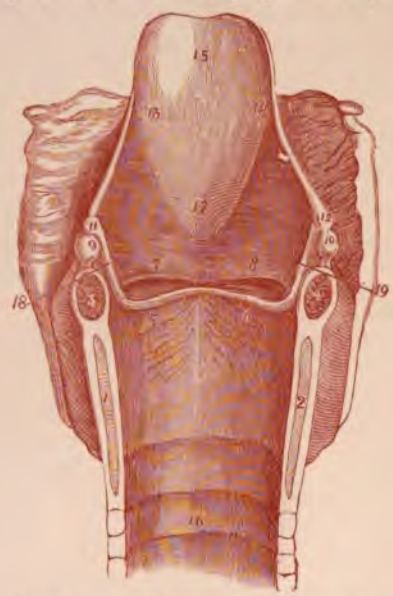


FIG. VI.—VIEW OF THE LARYNX OPENED FROM BEHIND.

1, 2. Cricoid cartilage.
3, 4. Arytenoideus muscle (cutaneous).
5 and 6. Vocal cords.
5, 6, 7, 8. Entrances to ventricles of Morgagni.
7 and 8. Superior thyro-arytenoid ligaments (ventricular bands).
9 and 10. Cartilages of Santorini.
11 and 12. Cartilages of Wrisberg.
11, 13, and 12, 14. Aryteno-epiglottidean (ary-epiglottic) ligaments.
15. Epiglottis. 16. Trachea.
17. Cushion of epiglottis.
18 and 19. Cuneiform cartilages.

ments (ventricular bands or false vocal cords, Fig. V. 4, 5), which are attached to their anterior surface.

The **Cartilages of Santorini** (Fig. V. 3) are situated above the upper pointed extremities of the arytenoids in the substance of the ary-epiglottic folds. They are conical in shape, small, and very pliant. Their function is probably to protect the apices of the arytenoid cartilages from the pressure of the epiglottis during deglutition, and to prevent that cartilage from too completely

closing the air-way. Elsberg therefore appropriately named them the 'Buffer cartilages.' Their use will be better understood by reference to the larynx of the ox, where it will be seen that they effectively prevent, on account of their large size, any very extensive lid-like action on the part of the epiglottis.

The **Cartilages of Wrisberg** (Fig. VI. 11, 12), or the cuneiform cartilages (Fig. VI. 18, 19), are two little wedge-shaped bodies embedded in the ary-epiglottic fold (Fig. VI. 11, 13, and 12, 14) in front of the arytenoids.

Bland Sutton has shown that the cartilages of Santorini and Wrisberg are vestigial structures representing lateral extensions of the epiglottis which pass back to the arytenoid region in some of the lower mammals.

The **Posterior sesamoid cartilages,** discovered by Luschka, are not invariably present, but, being frequently found in both sexes, they deserve some notice. They are very small, oblong in shape, and are attached, by means of delicate ligaments, above to the cartilages of Santorini, and below to the arytenoids. Their position is close to the lateral margin of the arytenoid cartilages, where these are surmounted by the cartilages of Santorini.

The **Anterior sesamoid cartilages** (Fig. XII. 11 and 12), each scarcely larger than the head of a pin, are embedded in the anterior part of the vocal cords, and they are united to the thyroid by means of a tough tissue which never ossifies, and serves as a point of attachment not only for the vocal cords, but also for the thyro-arytenoidei interni muscles. The existence of the anterior sesamoid cartilages is the rule rather than the exception, and not generally admitted.

The **Inter-arytenoid cartilage** is a little body which is sometimes found between the arytenoids. It was first noticed by Luschka, who describes a case in which it had the appearance of a yellowish prominence, that might easily have been mistaken for an abscess when seen with the laryngoscope. It is but very exceptionally present.

The **Epiglottis** is a single leaf-like piece of yellow fibro-cartilage, resembling in some respects an obovate leaf.

It is placed stalk downwards in front of the upper opening of the larynx, between it and the base of the tongue. So placed, it acts as a palisade or fence between the oral and laryngeal cavities.

Its stalk is firmly fixed to both the thyroid cartilage and hyoid bone, by strong ligaments; the thyro-epiglottic ligament running from the tip of the stalk to the angle of the thyroid

cartilage, whilst the hyo-epiglottic ligament runs from the posterior surface of the hyoid bone to the epiglottis, and so is incorporated with, and forms part of, the central thyro-hyoid ligament.

The body of the epiglottis is secured in its position by five well-marked bands or folds, three of which run forwards to the base of the tongue, and two backwards to the arytenoid cartilages.

The central ligament in front is a fold of mucous membrane strengthened by fibro-elastic tissue, passing from the centre of the blade of the leaflet to the base of the tongue, where it spreads out and becomes continuous with the fibrous covering of that organ.

The central glosso-epiglottic ligament is incorporated with a strong, white, fibrous membrane (a part of the pharyngeal aponeurosis) which covers the entire surfaces of the front aspect of the epiglottis. The membrane is attached to the whole length of the hyoid bone, and, passing off from the sides of the epiglottis in two prominent folds, spreads out laterally to line the fossæ for the tonsils. This membrane we have ventured to name the hyo-epiglottic membrane, and the two prominent lateral folds the amygdalo-epiglottic ligaments.

The so-called lateral glosso-epiglottic ligaments have no existence in form or substance when the tongue is in its normal position in the mouth, but if the tongue be much protruded they can be seen as two folds of simple mucous membrane running from the sides of the tongue to the epiglottis.

The lateral margins of the epiglottis are better defined on its laryngeal aspect than on its lingual, where they are more or less obscured by the expansion of the hyo-epiglottic membrane.

The posterior or aryteno-epiglottidean folds are two thick bands, composed of muscle and mucous membrane, which run backwards from the recurved sides of the epiglottis to the arytenoid cartilages, and separate the cavity of the larynx from the pyramidal or hyoid fossæ.

The hyo-epiglottic ligament connects the epiglottis with the basi-hyal. Bland Sutton has pointed out that in man it is a vestigial representative of a well-formed muscle in the horse, whale, and some other animals.

The epiglottis, as a whole, is much curved upon itself, both from above downwards and from side to side, being concave from above downwards in its lingual aspect, and convex in its laryngeal from side to side; it is also convex ventrally, but the reverse dorsally: it is in fact saddle-shaped, though the degree of curvature in every direction widely varies.

An eminence often well marked, sometimes almost absent—

the cushion of the epiglottis—exists on its laryngeal or dorsal aspect, at the junction of the stalk with the blade. Its size and colour vary considerably in different individuals.

Some discussion has arisen in recent years as to the position, movements, and function of the epiglottis. In a paper read at the International Medical Congress at Washington, 1887, my lately deceased colleague, Carmalt Jones, submitted as the result of extended laryngoscopic observations, that the epiglottis did not shut over the larynx like a lid in deglutition as commonly held, but curled in laterally like a split tube, in order to allow the food to pass down by its sides into the pyriform fossæ. At a later date this subject was threshed out at the Anatomical Society, with the result that the correctness of the above views is now generally conceded, and the greater importance of the epiglottis in respiration and voice-production insisted on. There is little doubt that the soft palate above and the epiglottis below together form a partition or diaphragm by which the respiratory air is shut off from the oral cavity during ordinary normal breathing through the nose. The upright position of the epiglottis enables it to act as a wall, which prevents the oral and nasal secretions entering the larynx. Professor Howse, from the fact that the epiglottis exceptionally occupies an intra-narial position in some animals, argues that this is the primitive condition of the organ. This is probably going too far. It is curious that the epiglottis is essentially a mammalian structure; only a few birds, such as the swan, possessing even a rudimentary organ, and it must be remembered that in birds the larynx is not the organ of voice.

A correspondence, which took place some years ago with regard to the best method of restoring suspended animation, brought out the fact that the epiglottis, except for the action of the ary-epiglottidean muscles, is not a very movable organ in itself. There is no doubt that it can be raised by direct traction on the hyoid bone through the hyo-epiglottidean ligament, or indirectly through the action of the muscles which pass from that bone to the tongue and jaw; but Howard's method of extreme extension of the neck to relieve respiratory troubles during anæsthesia is scarcely likely to find favour as the 'only true way' of giving such relief in operations performed on the throat and nose, for the very simple reason that Howard's method presupposes the absence of marked nasal obstruction, a factor complicating probably three out of four patients operated on in this special domain.

The cavity of the larynx is divided into three compartments; the first and largest (**supra-glottic**) is that which lies above the

ventricular bands, and is heart-shaped, the broader part being situated anteriorly and corresponding to the line of the epiglottis, the lateral walls being formed by the folds connecting the epiglottis with the arytenoid cartilages.

The second or **glottic** division is that part which comprises the ventricular bands (Fig. VI. 7 and 8), the vocal cords (Fig. VI. 5 and 6), and the ventricles of Morgagni.

The **Ventricular Bands,** formerly called false vocal cords, are longitudinal glandular folds of mucous membrane containing a little fibrous tissue (superior thyro-arytenoid ligaments). Anteriorly they are attached to the thyroid cartilage (Fig. V. 5), and posteriorly to the anterior surface of the arytenoids. They are capable of being closely approximated, and by this means the upper division of the cavity of the larynx is separated from the two lower ones, thus forming a narrow tube with a closed bottom. This closure of the ventricular bands takes place at the moment of deglutition, and in many other muscular efforts, such as in coughing, straining, and bearing down.

The **Vocal Cords.**—The vocal cords, bands, tongues, reeds, ligaments, or lips, as they have been variously called, are two ledges or bands of pure yellow elastic tissue, attached to, and continuous with the upper and free margin of the crico-thyroid membrane, which it is essential to first describe.

The **Crico-thyroid** membrane, a thin, fibro-elastic structure, is attached to the anterior two-thirds of the ring of the cricoid cartilage, at its upper and inner margin. Passing upwards and converging in its ascent behind the thyroid cartilage, it is attached to the angle of the thyroid cartilage at its inner aspect, about a quarter of an inch from its lower border; posteriorly it is attached to the vocal processes of the arytenoid cartilages, and to part of the outer border of their base. The upper, free margin of this membrane, strengthened by antero-posterior bands of yellow elastic tissue, and placed as a movable ledge, constitutes the inferior thyro-arytenoid ligaments, or true vocal cords, the instruments of vocalisation.

The inner aspect of the crico-thyroid membrane is smooth, and is lined with a closely adherent mucous membrane. This inner aspect is covered by the thyro-arytenoid muscles, from which various strands and fibres of muscular tissue pass to be attached at short lengths to the vocal cords and upper portions of the thyro-hyoid membrane. By means of these fibres the vocal cords can be shortened as vibrating bodies, and stopped or overlapped at varying portions of their extent.

The length of each vocal ligament, when at rest, is in the male about three-fourths of an inch; in the female about half an inch. The exact attachments of the cords to the thyroid and to the arytenoids respectively have been explained, but it has to be noted that they are in no sense of the nature of strings. Their contour on section is not round but triangular, and their shape is therefore that of a prism; neither the superior nor inferior surfaces are entirely free, only their thin opposing edges—that portion which would on section constitute the apices of the triangles. The vocal cords constitute, in fact, a pleat or fold of the crico-thyroid membrane, and bear a very close resemblance to a fold of a concertina. In strong contrast with the red ventricular bands, the vocal cords are white, and this is particularly well marked in women. Bland Sutton has put forth the view that the vocal cords are morphologically really only the metamorphosed inner edges of the thyro-arytenoid muscles which have become tendinous, in order to give a central attachment to some of the muscular fibres and as better adapted to vocal function. The yellow elastic tissue, a special characteristic of these tendons, is necessary for the due maintenance of tension without muscular effort, and obviates the 'wrinkling' which would otherwise follow on relaxation of the structure.

The **Ventricles of Morgagni** (Fig. VI. 5, 7, and 6, 8) are two spaces between the ventricular bands and the vocal cords, leading up to the saccules of which they constitute the inferior aperture. They are elliptical in shape, and vary very greatly in size in different individuals.

The **Sacculus laryngis** is a comparatively unimportant structure in man, representing those air sacs which extend from the larynx over the front of the neck and chest, even as far as the armpits, in anthropoid and other apes, in whom they appear to act as accessory bellows.

The sacculi are lined by muciparous glands and a large amount of lymphoid tissue ('laryngeal tonsil'), which reach down to the lateral attachments of the surface of the vocal cords. A further account of the glandular structures of the ventricle will be found later.

It may be noted that these pouches are compressed by a slip of the ary-epiglottideus or Hilton's muscle.

The third, or **infra-glottic** division, is that portion of the larynx which extends from the inferior surface of the vocal cords to the lower border of the cricoid—the beginning of the trachea.

The second division of the larynx is, in the physiological as

well as in a clinical sense, the most important of the three; for not only by the action of air expired from the lungs on to the vocal cords is vocal sound actually produced, but these same vocal cords play a prominent part in the function of respiration. This narrow orifice may well be termed 'the portal of the breath of life.' Technically, it is called the **Glottis,** or, more correctly, **Rima Glottidis** (chink of the glottis). The rima glottidis in repose is more or less elliptical in shape (*see* Fig. 92, PLATE X.; and Fig. VII.), longer in the male than in the female, measuring nearly one inch in the former and two or three lines less in the latter. The form of the rima glottidis varies greatly in different

FIG. VII.—THE LARYNX IN GENTLE BREATHING.

FIG. VIII.—THE LARYNX IN TONE PRODUCTION.

T. Tongue.
V, V. Vocal cords.
W, W. Cartilages of Wrisberg.
L. Epiglottis.

FIG. IX.—THE LARYNX IN DEEP BREATHING.

P, P. Ventricular bands, or pocket ligaments, formerly called false vocal cords.
B. Bifurcation of trachea.
C. Cushion of epiglottis.

S, S. Cartilages of Santorini.

actions of the cords, being almost closed in the production of certain vocal notes (Fig. VIII.), while in full inspiration its form is irregularly triangular (Fig. IX.), the apex being anteriorly at the thyroid angle, whence the vocal cords arise (anterior commissure of the vocal cords); the two posterior angles at the arytenoid cartilages, where the same cords are inserted, while the base, which is somewhat curved, is formed by the space between these cartilages (inter-arytenoid space, or posterior commissure of the vocal cords).

We have now to treat of the functional movements of the vocal cords, which are regulated by certain muscles.

Of these it will be sufficient to enumerate those known as the intrinsic muscles of the larynx, which may be classified somewhat as follows :—

ACTIONS OF MUSCLES.

I.—NARROWING THE VESTIBULE.

Thyro-ary-epiglottidei	Ary-epiglottici Thyro-epiglottidei	Respiratory.
Arytenoideus		

II.—GOVERNING THE SHAPE OF THE RIMA GLOTTIDIS.

Thyro-arytenoidei ex- and interni Crico-arytenoidei laterales .	Close true glottis . .	Vocal and respiratory.
Arytenoideus	closes cartilaginous glottis .	
Crico-arytenoidei postici . .	open glottis . . .	Respiratory.

III.—GOVERNING THE PITCH OF THE VOICE.

Crico-thyroidei . . .	Tense the vocal cords.
Thyro-arytenoidei interni . .	Shorten, relax, and bring in apposition various sections of the vocal cords, and act as local extensors.

The **Crico-arytenoidei postici** (Fig. X. 18 and 19) are the separators or abductors of the vocal cords, and are called into action on inspiration. They are two triangular muscles, the bases of which are attached to the posterior aspect of the cricoid cartilage, from which origin they converge upwards and outwards in such a manner as eventually to grasp the processus musculares of the arytenoids (Fig. III. 4). By drawing these backwards and inwards the processus vocales (Fig. III. 3) are moved outwards, and the rima glottidis is thus thrown open. The extent to which this takes place depends, of course, upon the varying requirements of deep or ordinary respiration.

Carl Merkel and Sir William Turner have described an occasional additional muscle of the larynx, which, according to the first-named observer, when present exists asymmetrically, *i.e.* only on one side. It arises close to the origin of the lower or inferior fibres of the crico-arytenoideus posticus, so that it appears as an additional portion of the same. It does not, however, pass upwards with this last muscle, but extends obliquely upwards and outwards, and after a short course is attached to the posterior margin of the inferior horn of the thyroid cartilages. The inferior laryngeal nerve passes under it, and the kerato-cricoid ligament crosses it at nearly a right angle. The entire muscle is about 3-4‴ long, and it has received the name of the **Kerato-cricoid.** Merkel does not attach importance to its action, which is supposed to fix the lower horn of the

thyroid backwards and downwards, and thus to oppose in some measure the portion of the crico-thyroid muscle connected to the anterior margin of the horn. The frequency of appearance of this muscle is given by Turner as about 21 per cent. The same observer's examination modifies Merkel's statement that the muscle is always unilateral.

The **Crico-arytenoidei laterales** (Fig. IV. 5, 7) have their origin along the upper border and outer surface of the sides of the cricoid cartilages. They are directed obliquely upwards and

FIG. X.—THE MUSCLES OF THE LARYNX SEEN FROM BEHIND.

1, 2. Cricoid cartilage.
3, 4. Arytenoideus muscle.
5 and 6. Thyroid cartilage.
7, 8. Hyoid bone.
9 and 12. Cartilages of Santorini.
10 and 13. Cartilages of Wrisberg.
11, 15, 14. Epiglottis.
16. Trachea.
17. Thicker (cushion) portion of epiglottis.
18 and 19. Crico-arytenoidei posterior muscles.
20, 21 and 22, 23. Arytenoidei constrictores vestibuli laryngis muscles.

backwards, to be inserted into the outer angles of the bases of the arytenoid cartilages, as well as to the adjacent parts of the anterior surfaces in front of the posterior crico-arytenoid. The upper fibres are in close contact with, and sometimes blended with, the fibres of the thyro-arytenoids.

The **Arytenoideus** (Fig. X. 3, 4) is a square muscle, which is attached to the posterior concave aspect of the arytenoid cartilages, and it serves to assist the crico-arytenoidei laterales in closing the glottis. If the action of the arytenoideus precedes

that of the crico-arytenoidei laterales, then the rima glottidis takes for a moment a rhomboid shape; if, on the other hand, the action of the crico-arytenoidei laterales precedes that of the arytenoideus, then the vocal cords will be approximated, while the space between the arytenoid cartilages remains open. The most recent view is that the arytenoideus represents a continuation of the thyro-arytenoideus, and that it further exemplifies the existence of a sphincter of the glottis.

The **Thyro-arytenoidei** (Fig. IV. 1, 2, 3, 4) are two broad,

FIG. XI.—SIDE VIEW OF THE LARYNX, SHOWING THE RIGHT CRICO-THYROID MUSCLE.

1, 2, 3. Crico-thyroideus muscle.
4. Right inferior cornua of thyroid.
5. Thyroid cartilage.
6, 7. Superior cornua of thyroid.
8. Epiglottis.
9. Trachea.

flat, fan-shaped muscles running parallel with, but immediately external to, the vocal cords, to which they are partly inserted. These muscles are attached anteriorly to the internal suface of the thyroid cartilage, the lower fibres lying close to the angle formed by the junction of the two alæ. Each muscle consists of at least two well-marked portions, having a different disposition, insertion, and action.

The lower portion is a thick, well-marked, fleshy fasciculus, receiving a few additional fibres from the outer surface of the crico-thyroid membrane; it passes backwards to be inserted into the

anterior projection, or vocal process of the arytenoid cartilage, external, and close to the vocal cord, as well as to the adjacent surface, and near to the insertion of the lateral crico-arytenoid muscle of that side.

The upper thin portion of the thyro-arytenoid muscle is inserted higher up on the anterior surface and outer border of the arytenoid cartilage, partially embracing the laryngeal pouch. Some of its fibres pass round the outer border of the arytenoid cartilage, and become continuous with the transverse fibres of the arytenoideus, and underneath the oblique fibres of the ary-epiglottideus.

FIG. XII.—VIEW OF A SECTION OF THE LARYNX FROM ABOVE.

1, 2. Processi musculares of the arytenoids.
3, 3. Cricoid cartilage.
4, 1 and 5, 2. Posterior crico-arytenoidei muscles.
6, 7. Processi vocales of arytenoids.
6, 11 and 7, 12. Vocal cords.
8. Arytenoideus muscle.
9 and 10. Elsberg's 'vocal nodules.'
11 and 12. Sesamoid cartilages.
13 and 14. Thyroid cartilage.
15 and 16. Crico-arytenoidei laterales muscles.
17 and 18. Thyro-arytenoidei muscles.
19 and 20. Crico-arytenoid ligaments.

The lower portion of the muscle is external to, and continuous with, the corresponding vocal cord and crico-thyroid membrane, with which some fibres of varying lengths are merged.

A third portion is sometimes found (the small thyro-arytenoideus of Soemmering) arising from behind the thyroid notch, close to the mid-line, and, passing internally to the pouch, is inserted into the antero-external surface of the arytenoid cartilage near its base.

The **Ary-epiglottici** (Fig. X. 20, 21 and 22, 23) are two thin flat muscles which, arising from the outer and posterior border of the apices of the arytenoid cartilages, pass upwards and over to the opposite side through the ary-epiglottic folds to the epiglottis, encircling in their route the tapering points of the arytenoids just below the cartilages of Santorini, and then

stretching across the cuneiform cartilages. These muscles have received the names of the *constrictores vestibuli laryngis*. They tend to bring together the tips of the arytenoid cartilages and to make the epiglottis curve inwards at its edges, assuming the shape somewhat of a split tube during deglutition. They probably exercise the same action during phonation, and may also aid in depressing the edges of the epiglottis.

The **Crico-thyroidei** (Fig. XI. 1, 2, 3) are the only intrinsic muscles of the larynx perceptible from the outside of the dissected larynx. Each of them consists of two bundles, which together present a fan-like appearance. Their lower ends are pointed, and arise from the antero-lateral portions of the cricoid cartilage; the fibres, diverging, pass obliquely upwards and backwards, to be inserted, some into the lower borders of the thyroid cartilage, and anterior borders of its lower cornu, a few others into its internal and external surfaces near the borders. The action of these muscles is to draw the thyroid forwards and downwards, and to tilt the cricoid and arytenoid cartilages backwards, thereby putting the vocal cords on the stretch. Majendie, in 1813, maintained a contrary opinion of the action of these muscles, asserting that they draw the cricoid cartilage up towards the thyroid; and this view has recently been revived, especially by Hooper of Boston, who, after numerous experiments, confirms Majendie's statements. Practically the point is not one of great importance, since the effect of the muscular movement is, in either case, equally to stretch the vocal cords. The latest writer on this subject, Desvernine, says that he attributes to the crico-thyroid muscles an active part in regulating both the longitudinal and transverse diameter of the cords.

The **Arteries** supplying the larynx are branches derived from the superior and inferior thyroid, the former of which is a branch of the external carotid, and the latter of the thyroid axis from the subclavian. Other small branches pass in from the lingual and ascending pharyngeal.

The superior or superficial laryngeal artery from the upper thyroid passes upwards, inwards, and downwards, in company with the superior laryngeal nerve, and pierces the thyro-hyoid membrane on its way to the interior of the larynx. When in the larynx the vessel is situated between the thyroid cartilage and thyro-arytenoid muscles, and distributes branches to the whole of the structures contained in the larynx, joining above with twigs from the lingual and tonsillar and below with others from the superior laryngeal, an offshoot of the inferior thyroid

artery. The inferior laryngeal artery is of irregular size; ascending along the back of the trachea and larynx, it is distributed to the small muscles and mucous membrane in the neighbourhood of the arytenoid cartilages, to join with the superior laryngeal.

The **Veins** of the larynx correspond exactly with the arteries. The upper laryngeal veins, piercing the thyro-hyoid membrane, join the internal jugular, the lower facial, or sometimes the superior thyroid veins.

The **Lymphatics** of the larynx join the deep cervical glands. Those above the vocal cord, piercing the thyro-hyoid membrane with the artery and nerve, end in the upper set of the deep cervical glands which also communicate with those collecting from the upper half of the common carotid artery and internal jugular vein. Those below the glottis pass out of the larynx by piercing the crico-thyroid membrane, and, after receiving branches from or passing through several small glands on the anterior and lateral aspect of the lower part of the larynx, enter the lower set of the deep cervical glands corresponding to those on the lower half of the carotid artery and internal jugular vein.

The **Nerves of the Larynx** are the superior laryngeal and the inferior or recurrent laryngeal, both branches of the pneumogastric, the motor being of spinal accessory origin; together with a few filaments from the sympathetic which pass in with the arteries.

The nerves of the larynx communicate with each other in a very remarkable manner, forming junctions by very large branches, resembling to some extent the plexuses found in the walls of the stomach and intestines.

Very definite inosculations are found at two places, namely, at the back of the arytenoid cartilages under the pharyngeal mucous membrane, and at the sides of the larynx between the alæ of the thyroid cartilages, and the thyro-arytenoideus muscles. Many ganglion cells are found on the nerves at these points of junction, and also on the branches, both as they enter the muscles, and as they are distributed to the mucous membrane.

End-bulbs have also been found on those branches distributed to the laryngeal aspect of the epiglottis.

The superior laryngeal nerve, in its course downwards, is quite superficial, lying in the mucous membrane of the outer aspect of the ary-epiglottic folds.

The mucous membrane of the larynx and the crico-thyroid muscles are supplied by the *superior* laryngeal, and the remaining muscles by the *recurrent* laryngeal, the arytenoideus receiving

filaments from both. It is essential to bear in mind the course of these *recurrent* nerves, which is not the same on both sides. On the right side the nerve arises in front of the subclavian artery, winds round that vessel from before backwards, and then ascends obliquely to the side of the trachea behind the common carotid and inferior thyroid arteries, to enter the larynx below the inferior border of the superior constrictor and behind the crico-thyroid articulation.

On the left side it arises in front of the arch of the aorta, round which it turns to gain the side of the trachea. This branch of laryngeal anatomy, and especially the physiological aspect of laryngeal innervation, will of necessity be referred to in greater detail when treating of the 'Neuroses of the Larynx.'

The **Trachea** (Fig. I. 14) extends from the cricoid cartilage to its bifurcation opposite the fourth dorsal vertebra. It is about four and a half inches in length, and three-quarters of an inch in breadth, and is convex in front, but somewhat flattened behind. It is built up of cartilaginous rings, regular above, irregular below, from sixteen to twenty in number. The latter do not meet posteriorly, but are connected by fibrous tissue, as well as by bands of muscular fibre, whose contraction serves to materially lessen the calibre of the tube. The lining mucous membrane is covered with columnar ciliated epithelium, and contains much lymphoid and mucous glandular tissue.

It divides into two **bronchi,** one for each lung, that for the right being the larger of the two. Foreign bodies falling down the tube are generally said to drop into the right bronchus. From statistics made by Cheadle, however, it would appear that they as frequently pass down the left. It must be remembered that though the right bronchus, which is the larger, is also the more horizontal, the left runs more nearly in the same direction as the trachea. Bodies would no doubt always go to the left were it not that the pathway in that direction is smaller, and that the septum marking the division of the two bronchi is situated to the left of the tracheal axis, so that bodies hitting this septum are often diverted into the larger right bronchus.

HISTOLOGY.

The structural elements of the different regions of the larynx, whilst resembling those in other regions of the body, exhibit, however, certain peculiarities in their arrangement and distribution which justify special histological consideration, founded

in some measure upon the clinical and pathological significance that they afford.

The cricoid and thyroid cartilages, with the greater part of the arytenoid cartilages, are hyaline, whilst the epiglottis, as also those of Santorini, Wrisberg, and Luschka, are of the fibro-elastic variety.

The perichondrium of the hyaline cartilage is composed of white and elastic connective tissue directly continuous with the matrix, where the fibres are so densely packed as to appear homogeneous, but become more open and vascular towards the surface.

In the case of the elastic cartilages, the perichondrium is not so highly differentiated; there is not such an abrupt transition, for the loose vascular perichondrium becomes gradually blended with the elastic elements of the matrix. This fact may partly explain the greater severity of the pain occurring with perichondritis of the arytenoid cartilage than is the case with that of the more resilient covering of the epiglottis.

No detailed description of the cartilages themselves is demanded, since they conform to the usual types, but it is worth noting that, while the hyaline cartilages are subject to age ossification, the elastic are not. The thyroid is the first to undergo such a change; it commences at about twenty years of age, in the inferior cornua and the central lamina of the angle. The cricoid ossifies symmetrically from its upper border just below the arytenoid facets. The change is exhibited in the arytenoids from their base upwards, but it never extends to the vocal process, which generally remains elastic in structure. Ossification usually commences earlier and progresses more rapidly in the male than in the female.

The **mucous membrane** of the larynx presents such marked local variations, that it will be found expedient to describe it regionally; *e.g.* upon the vocal cords the different elements have become so attenuated that only epithelium remains, whilst the ventricular bands exhibit a very high degree of differentiation.

Each **vocal cord** consists for the most part of elastic fibres, blending, in front, with the thyroid perichondrium, and with its fellow; behind, with fibrous matrix of the arytenoid vocal process; and laterally, with the mixed white and elastic fibres of the crico-thyroid membrane. These elastic fibres are arranged parallel to the glottis, where they are very dense, but laterally they are much looser, and mingled with the white or gelatine fibres of the thyro-arytenoid tendon; in fact, each cord is a highly differentiated elastic tendon of that muscle.

Although the vocal cords appear smooth to the naked eye, they present minute wrinkles when magnified, especially on their upper or ventricular surface, where blood-vessels are more numerous and epithelial transition begins. These wrinkles are both longitudinal and transverse; those in the first direction being probably due to shrinkage during hardening, whilst the transverse doubtless follow removal of the elastic cord from its attachments.

The cords are covered with stratified squamous epithelium wherever there is friction, but where this friction is but slight as in a portion of their ventricular aspect, the original columnar ciliated cells characteristic of the respiratory tract are occasionally retained.

The whole glottic region is covered with squamous epithelium, even the inter-arytenoid or respiratory portion, and occasionally, especially late in life, the ary-epiglottic folds and ventricular bands may be similarly covered.

It is worth noting that at the anterior attachments of the vocal cords the parallel elastic fibres interlace with their fellows of the opposite side, forming with the surface epithelium the *anterior commissure* well marked in early life. One of the commonest malformations is a 'web' in this situation, which may reasonably be explained as an exaggeration of the normal state.

At the 'anterior and inferior' part of the cord is found, according to Klein, a small nodule of elastic cartilage—the *cartilage of Luschka*. Its existence is, however, not constant. See p. 13.

Near to the junction of the anterior and middle thirds of the cords, well-defined and symmetrical thickenings are frequently observed. There is a growing tendency to refer to these as 'Singer's Nodes,' but whatever may be their clinical interpretation when unduly prominent, histologically they are homologous in their nature, and consist of tissue normal to the part in various degrees of accentuation.

Many authorities assert that glands occur in, and open on to, the surface of the cords themselves, whilst others even doubt their existence; they are certainly not very numerous. According to Chiari, they are not found in the middle third. Their disappearance is doubtless coincidental with the differentiation in function and structure, since they are more numerous in the lower vertebrates. These glands are interesting, since they may be the starting-points of neoplastic changes both innocent and malignant.

The **Ventricular Bands or False Vocal Cords** (Fig. XIII.)

differ widely in their structure and appearance from the vocal reeds proper, being corrugated, deeply fissured by gland ducts, and entirely covered with ciliated epithelium, excepting in old age and in certain morbid states, when their edges may be invested by squames.

The epithelium rests upon a brightly refracting hyaloid membrane similar to that occurring in the nose. Below it bundles of white and elastic fibres are seen running in all directions, entangling round, fusiform, and branched connective tissue cells embedded in a matrix of mucin. Blood-vessels are not only numerous but large, and apparently break up into a delicate plexus of capillaries in the hyaline sub-epithelial border.

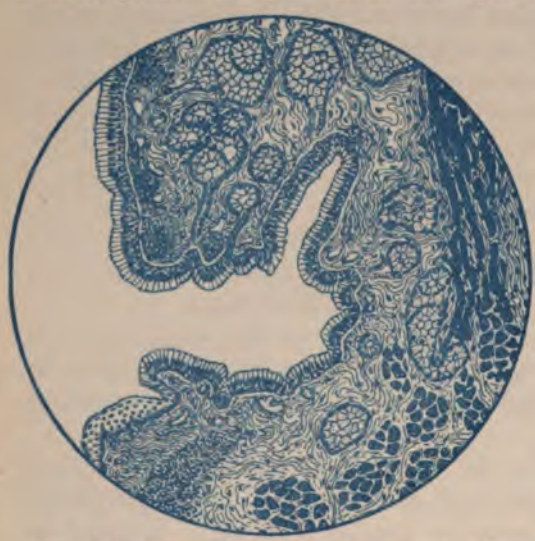


FIG. XIII.—SECTION THROUGH VENTRICULAR BAND AND VOCAL CORD (‡ *in. Obj.*).

But the most characteristic feature of the ventricular band is the presence of numerous acino-tubular glands, whose ducts open upon its median as well as its ventricular and saccular aspects. These glands are for the most part mucous, their cell-contents being either cloudy or clear according to the methods of hardening or to the stage of activity or rest, while the ducts are lined with plain columnar cells. Here, as in the trachea, immediately beneath the hyaloid membrane is found a well-defined layer of lymphoid tissue, strands of which are often seen extending into the deeper parts of the band, so giving in section the appearance of lymph nodules, and affording an excuse for the name *Laryngeal Tonsils*. These masses, however, do not conform in structure to the true lymph nodules of a tonsil, since they are not grouped regularly, they are not connected with lacunæ or crypts, and they are not surrounded by a well-defined lymph path. Further, the lymphoid tissue does not reach the surface as in the case of the faucial tonsil, since it is everywhere closely invested by the hyaloid membrane with its 'palisade' epithelium.

In the upper and outer parts a few longitudinally disposed fibres of the superior thyro-arytenoid muscle are often found.

The **Ventricles and Saccules** (Fig. XIII.).—The *ventricles*, strictly speaking, are the intervals between the vocal reeds below, and the ventricular bands above, consequently they extend the whole length of the *vocal* glottis; while the *saccules* or pouches are simply slits leading upwards, outwards, and forwards from *the anterior third* of the ventricles. The saccules are well seen in dried specimens, but in the recent state their walls are practically in contact. Morphologically they represent the vestigial remnants of the connection between the larynx and the cervical pouches so well marked in the howling monkeys, and are not infrequently associated with cysts in man (Bland Sutton). The outer wall of the pouch is bounded by some fibres of the thyro-arytenoid muscle, mucous glands, loose connective tissue, and the thyro-perichondrium.

FIG. XIV.—SAGITTAL SECTION THROUGH CENTRE OF INTER-ARYTENOID FOLD ($\frac{1}{2}$ *in. Obj.*).

Both ventricles and saccules are lined with columnar ciliated epithelium resting upon the hyaloid membrane. The mucous membrane here presents well-marked corrugations, especially in the upper and outer walls, irregularities of surface often so accentuated as to constitute a long tongue-like fold projecting across the ventricle almost to the glottic aperture. This feature is of sufficiently frequent occurrence as to afford a reasonable explanation of the condition described as *eversion or prolapse of the ventricle*, for the 'tongue' or corrugation might under certain morbid changes become sufficiently hypertrophied and prominent as to constitute the characteristic laryngoscopic appearance often described under the above name.

Numerous mucous glands open by ducts of various length into all parts of the ventricles and saccules, especially on the under surface of the ventricular bands.

The **Inter-Arytenoid Region.**—The great clinical interest which is attached to this portion of the larynx justifies a specially detailed examination of its structure. Fig. XIV. illustrates a sagittal section taken about midway between the arytenoids, and includes a portion of the cricoid cartilage. Stratified squamous epithelium surmounting a hyaline basement membrane covers the whole of this area, excepting a small portion on the laryngeal aspect of the cricoid which is ciliated.

It is seen to consist chiefly of very loose connective tissue traversed by white and elastic fibres entangling nucleated cells 'fixed' and 'wandering,' and permeated by numerous lymph paths. The anterior or laryngeal aspect (to the reader's left in Fig. XIV.) is chiefly vascular, with but few glands, but the posterior or pharyngeal is studded with compound acino-tubular glands. Lymphoid tissue may sometimes be seen in the young, but is practically absent in the healthy adult. The central part is occupied by the transverse and oblique fibres of the arytenoid and aryteno-epiglottic muscles respectively arranged in well-defined bundles.

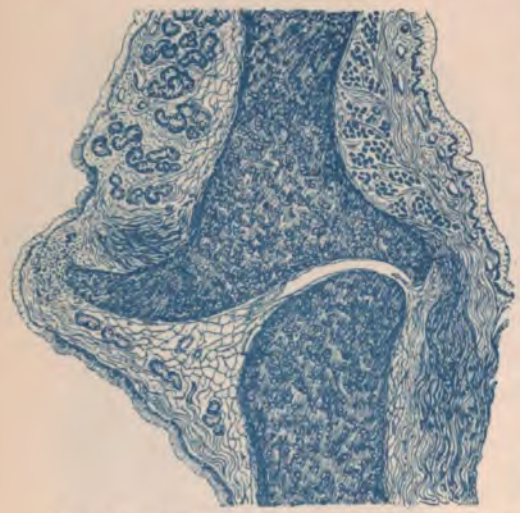


FIG. XV.—SECTION THROUGH CRICO-ARYTENOID ARTICULATION (½ *in. Obj.*).

The looseness of the connective tissue is perhaps the most significant feature of this region, since it admits of considerable variation in bulk attendant upon acute or chronic inflammatory changes, due either to simple vascular hyperæmia, or to leucocytosis and interstitial changes, recurring attacks of which cause permanent thickening; this condition may result in imperfect approximation of the arytenoids and corrugations extending downwards to the posterior commissure, and constitute in fact the characteristic features of Pachydermia laryngis, Laryngitis sicca, etc.

Fig. XV. illustrates a section taken through the crico-arytenoid articulation. It will be noticed that looseness of the connective

tissue is still marked, especially below and in front of the joint. Glands are numerous on the laryngeal aspect (the reader's left in the figure), more so, in fact, than usual. The synovial membrane is extremely thin, not amounting to more than a continuation of the perichondrium.

Fig. XVI. represents a vertical and coronal section of the larynx taken somewhat out of the middle line in order to include the vocal reeds and ventricular bands; consequently only a small part of the epiglottis is included. It is not quite vertical, and just misses the saccule. The characteristic loose arrangement of the areolar tissue is particularly marked in the region of the ventricular bands, but the glosso-epiglottic pad of fat is not seen. Variations in the size of this mass of adipose tissue, and the developments of the glosso- and hyo-epiglottic ligaments may together or individually be responsible for the position of the epiglottis itself. Some fibres of the thyro-arytenoid and thyro-hyoid muscles are to be noted. The tissue covering the epiglottis, like that continued into the ary-

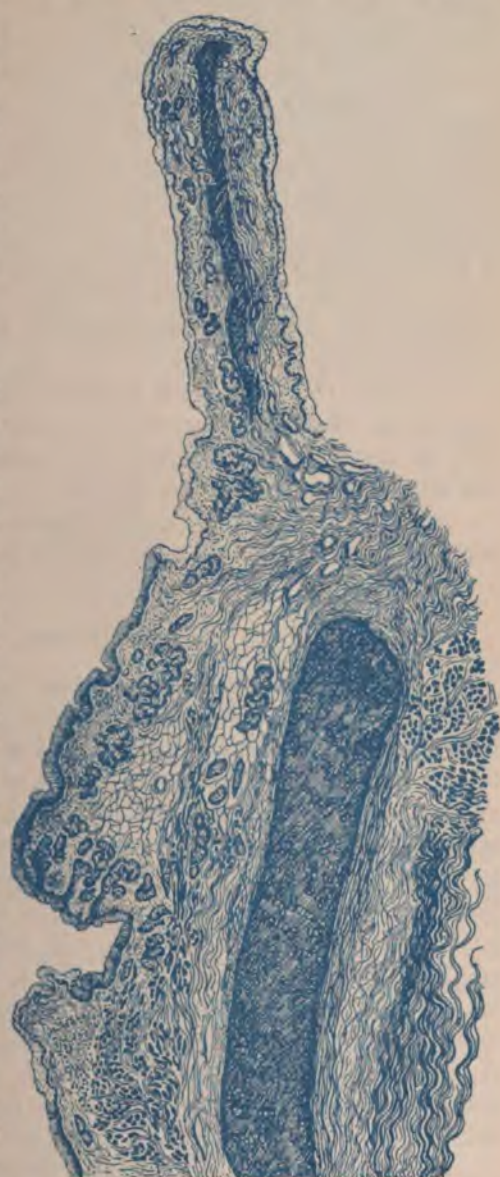


FIG. XVI.—VERTICAL SECTION OF ONE SIDE OF THE LARYNX (1 *in. Obj.*).

epiglottic folds, is extremely loose, and encloses a few mucous glands which are generally much accentuated at the 'cushion.' The epithelium on both aspects is of the stratified squamous variety, but on the cushion area is ciliated.

The **Sensory Nerves** terminate as (1) delicate arborisations amongst the epithelium (especially the stratified); (2) end bulbs; and (3) taste-buds on the epiglottis.

Bland Sutton's recently expressed views as to the morphology of certain parts of the larynx are of such interest as to justify a short summary supplementing the previous references.

1. That the vocal cords or inferior thyro-arytenoid ligaments arise from the tendinous metamorphosis of the sub-mucous fibres of the thyro-arytenoid muscle.

2. That the false vocal cords or ventricular bands with the cuneiform cartilages are the degenerate representatives of a bar of cartilage which originally connected the epiglottis with the cornicula, as in the porpoise, etc.

3. That the hyo-epiglottic ligament in man is the fibrous representation of a well-formed muscle in other mammals.

PHYSIOLOGY.

This has already been touched on in the Anatomy. It remains to be stated that, while the essential function of the larynx is, as its name implies, that of phonation or voice-production, the organ performs certain duties in the course of deglutition and respiration. During the passage of food over the superior aperture of the larynx, the whole organ is drawn upwards and forwards under the base of the tongue, following to some extent the movements of the hyoid bone, to which, as has been seen, it is attached by ligamentous and muscular structures. The epiglottis is curled laterally, forming a narrow tubular entrance for air from the nose to the larynx, and lid-like closure is somewhat prevented by the presence of the cartilages of Santorini. Approximation of the ventricular bands also takes place, together with a constriction of the vestibule or first part of the larynx, to aid, and in some cases to replace, the action of the epiglottis.

During respiration a rhythmical movement of the vocal cords takes place, the *rima glottidis*, or interval between the cords, enlarging during inspiration and becoming smaller during expiration.

It may be noted as a clinical fact, that if inspiration be unduly forced, the rima, as seen by the laryngoscope, is in such circum-

stances frequently narrowed rather than increased. This may be due either to the opposing muscles being brought into play, or simply to the impact of air on the concave upper surfaces of the cords leading to an approximation of the adjacent free edges.

For purposes of phonation the vocal cords require to be accurately adjusted to allow of the production of vibration, and this is effected in part by the muscles which approximate the cords and render them parallel, and partly by other muscles, which, by altering the relative position of the cartilages, cause the cords to become more or less tense. The muscles concerned in approximating the vocal cords are the *crico-arytenoides laterales* (Fig. IV. 5, 7), which, by pulling the external processes (the *processus musculares*, Fig. III. 4) of the arytenoids forwards, rotate inwardly the interior processes to which the vocal cords are attached (the

FIG. XVII.

A. GLOTTIS IN REPOSE. B. GLOTTIS IN DEEP INSPIRATION. C. GLOTTIS IN THE PRODUCTION OF TONE.

1, 2. Vocal cords. 5. Elastic band.
3, 4. Section of the arytenoid cartilages. 6, 7. Processus musculares of arytenoids.
8, 9. Processus vocales of arytenoids.

processus vocales, Fig. III. 3), and consequently bring them nearer to one another. By the contraction of the muscle which stretches from the back of one arytenoid cartilage to the other—the arytenoideus (Fig. XII. 8)—the cords are rendered parallel. They are rendered tense by the action of the crico-thyroid muscles (Fig. XI. 1, 2, 3), which tilt the thyroid cartilage forwards upon the cricoid, thus elongating the cords and putting them on the stretch; this tension can be increased by the compression of the thyro-arytenoidei muscles (Fig. IV. 1, 2, 3, 4), which muscles also tend to bring the free borders of the cords into more perfect apposition. When so adjusted, the impact of the expired air against the cords sets them in vibration; the vibrations are communicated to the column of air passing between them, and thus *vocal tone* is constituted; this tone, being

subsequently modified by the movements of the lips, tongue, soft palate, and teeth, becomes articulate speech.

Considered as a musical instrument, the human larynx is far too delicate and complicated a structure to admit of adequate comparison with any known musical instrument. The subject of pitch requires more space than can here be given to its consideration. It is not only dependent on the tension, length, and thickness of the vocal cords, but in a measure also upon the variations in length of the tube itself from the cricoid cartilage upwards. It is doubtful whether the trachea plays any important part in this respect, though it has been suggested that, in accordance with a general law, 'the calibre and length of the windpipe is less in short people than in tall, and therefore that persons with high voices are generally short in stature. Where the singer is tall, with tenor or soprano range, it has been thought that the windpipe branches off very high up, thus lessening the length of the tube, and that the windpipe and larynx are disproportionate to the stature; the opposite condition obtaining where persons of short stature have low voices.'

The ventricular bands, or, as they were formerly termed, the 'false vocal cords' (Fig. VI. 7, 8), have no share whatever in the initial production of tone; but may act in absence of the true vocal cords. They also approach during 'holding the breath,' in 'bearing down' efforts, and at the commencement of the act of coughing.

The function of the ventricles of Morgagni (Fig. VI. 5, 6, 7, 8) is probably to ensure greater freedom of motion to the vocal cords, and by means of the numerous glands contained in their walls to moisten the mucous membrane of the cords, a moist condition being apparently indispensable to normal voice production; the duty of the large mass of lymphoid tissue lining the ventricle in the manufacture and outpouring of scavenging leucocytes has been previously alluded to.

CHAPTER II

ANATOMY, HISTOLOGY, AND PHYSIOLOGY OF THE FAUCES AND PHARYNX

REVISED BY MAYO COLLIER, F.R.C.S.

THE MINUTE ANATOMY BY WYATT WINGRAVE.

IT is usual, in describing the appearance of the pharynx, to include also the appearance of the soft palate, with its pendulous process, the uvula, and the tonsils, situated one on each side of the arch between the anterior and posterior pillars. There can be no objection to such a plan, but, on the contrary, there is much to be advanced in its favour, if it be remembered that the pharynx commences much higher up, and extends considerably further in a downward direction, than is seen on mere ocular inspection of the open mouth—a fact not unfrequently forgotten in practice by young laryngoscopists.

The **Palate** forms the roof of the mouth, and may be described as consisting of an anterior part, *hard palate*, and a posterior part, the *soft palate*.

The **Hard Palate** is limited by the alveolar processes in front and at the sides; behind, it is continuous with the soft palate. The mucous membrane is here dense and thick, but is closely united with the periosteum, forming together a tough resisting membrane. There is a median ridge which terminates in front in a small papilla, corresponding to the orifice of the anterior palatine fossa. The mucous membrane on either side is corrugated, and is covered with squamous epithelium. It contains numerous acino-tubular glands, and much lymphoid tissue, which lie between the mucous membrane and the periosteum.

The **Soft Palate** (*velum pendulum palati*, Fig. XVIII.) is a membranous curtain attached to the posterior border of the hard palate, and separating to some extent the cavities of the mouth and pharynx. Laterally it blends with the pillars of the fauces, but its lower border is free, and of the outline indicated in

Fig. LXI. Bilateral development is marked as in the hard palate, with a median line or raphé, indicating its separation into two portions, whose non-union sometimes persists and thus constitutes a deformity, to the great detriment of the power of articulation, swallowing, etc., of the individual so afflicted.

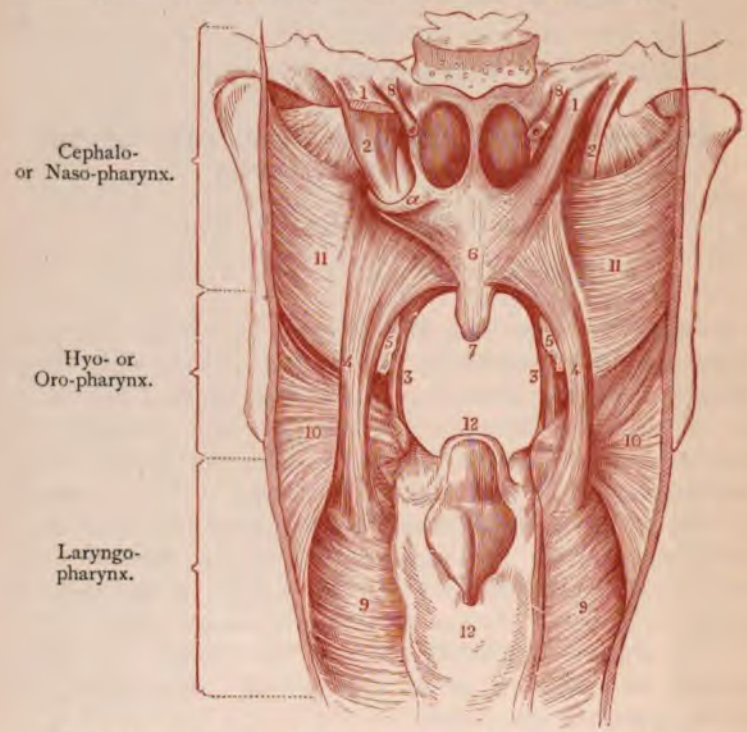


FIG. XVIII.—THE MUSCLES OF THE SOFT PALATE AND PHARYNX.
The Pharynx laid open from behind: Modified from Gray.

1, 1. Levatores palati, the left being cut short near to its origin.
2, 2. Tensores palati, the left showing its reflected tendon and relation to the hamular process (*a*).
3, 3. Palato-glossi (anterior pillars of the fauces).
4, 4. Palato-pharyngei (posterior pillars of the fauces).
5, 5. Tonsils.
6. Azygos uvulæ.
7. Uvula.
8, 8. Eustachian tubes.
9, 9. Inferior constrictors (laryngo-pharyngei).
10, 10. Middle constrictors (hyo- or oro-pharyngei).
11, 11. Superior constrictors (cephalo- or naso-pharyngei).
12, 12. Epiglottis and larynx not laid open.

(1) The muscles of the palate consist of five symmetrical pairs—namely, the *levatores palati* (Fig. XVIII. 1, 1), and the *tensores palati vel dilator tubæ* (Fig. XVIII. 2, 2); the *palato-glossi*, acting also in pairs as constrictors of the fauces, and constituting their anterior pillars (Fig. XVIII. 3, 3); and the *palato-pharyngei*

(Fig. XVIII. 4, 4), forming, in like manner, the posterior pillars. Between these two muscular pillars lie the faucial tonsils (Figs. XVIII. and XIX. 5, 5). Lastly, the *azygos uvulæ* (Fig. XVIII. 6), which is not a single muscle, as once supposed, but a pair of narrow, cylinder-like bundles of muscles placed side by side parallel to the median line of the soft palate, and, together with connective and glandular tissue, forming the pendulous portion known as the **Uvula** (Fig. XVIII. 7, etc.).

The palatal muscles are concerned not only in the act of deglutition, but also in a greater or less degree in vocalisation. The importance of the tensor and levator muscles in relation to the opening of the Eustachian tube, and consequently to the auditory functions, cannot here be more than alluded to (see Chap. XXVIII.).

(2) The utility of the uvula has been the subject of much speculation. It is without doubt of great service, together with the epiglottis and rest of the palate, in cutting off the oral cavity from the true respiratory channel in normal breathing. Probably it also acts as a drip-stone, conducting the nasal secretions to the glosso-epiglottic fossæ, whence they are directed by the epiglottis into the pyriform fossæ, as pointed out first by Dobell. When relaxed abnormally, the nares are imperfectly closed in the acts of both swallowing and tone-production, and there is a general paresis of the palatal muscles.

The **Tonsils.**—The tonsils of the pharynx are several collections of lymphoid tissue placed in the various recesses of the pharyngeal cavity. The most important are—

(1) The *Faucial Tonsils*, *Amygdalæ*, or tonsils proper;

(2) The *Pharyngeal Tonsils*, placed in the roof or vault of the pharynx, of which a smaller mass adjacent to the Eustachian tube is known as

(3) The *Lingual Tonsils*, a collection of lymphoid tissue at the root of the tongue;

(4) The *Eustachian* or *Tubal Tonsil.*

In addition, masses of lymphoid tissue are situated within and around the laryngeal pouch, to which has been given the somewhat misleading name of the *Laryngeal Tonsil.*

The **Faucial Tonsils** are two more or less obovate bodies, symmetrically placed in the faucial ring between the anterior and posterior pillars. Their mesial or free surface projects into the faucial isthmus, and externally or laterally they are bounded by the pharyngeal aponeurosis. *Above* is a triangular space, formed by the divergence of the faucial pillars. Behind the anterior is a depression known as the *supra-tonsillar fossa*, very variable in

depth and in definition. It has been interpreted as having a vestigial origin; but its clinical interest and importance, which are doubtful, have been exaggerated. *Below*, the tonsil overhangs a deep sulcus, separating it from the pharyngeal portion of the tongue. This gap is, however, often obliterated, so that the faucial and lingual tonsil appears to be continuous.

The exact position of the tonsil may be indicated on the side of the neck, when the head is in its normal position, by a spot corresponding to the interval between the angle of the lower jaw, the anterior border of the sterno-mastoid muscle, and the tip of the great cornu of the hyoid bone. At this site the tonsil can best be pushed inwards by the hand of the assistant, during tonsillitomy; and it also indicates the point for incision in any external surgical procedure.

External to the tonsil is a strong fibrous membrane, part of the amygdalo-epiglottic fold, which here spreads out and lines the whole fossa for the tonsil; and external still to this is the superior constrictor muscle, which, with the fibrous tissue lining the fossa, constitutes the only structures intervening between the tonsil and the sheath of the internal carotid artery. Pulsation from this vessel is frequently imparted to large or inflamed tonsils. The close proximity of the carotid arteries, as well as the ascending pharyngeal and ascending palatine vessels, are of surgical importance in operations on the tonsil, whether from within or without. It may also be mentioned that the lingual artery passes forward on the tongue close to the lower end of the tonsil, where it may readily be compressed.

The normal size of the tonsil is given by Quain as $\frac{1}{2}$ an inch in length, $\frac{1}{3}$ inch in thickness, and as weighing about 2 drachms, but the variations in size and weight are too numerous even in health to fix any definite standard.

Not to unduly anticipate a more minute description, the tonsil may be tersely described as a conglomeration of Peyer's patches. The depressions number from ten to twenty, and constitute the crypts of the tonsil.

The **Arteries** of the tonsil are numerous, and are derived from the facial through the ascending palatine and its tonsillar branches; from the lingual; and from the ascending pharyngeal. Lastly, twigs of the descending palatine from the internal maxillary may sometimes be traced.

The **Veins** of the tonsils correspond to the arteries, but, before accompanying their respective arteries, pass into and form a net-like plexus on the outer or carotid aspect of the tonsils.

From this plexus one or more branches pass out with each artery to join the facial, ascending pharyngeal, dorsales linguæ or palatine veins respectively. Large branches from the tonsillar plexus pass to the pterygoid and post-pharyngeal veins.

The **Lymphatics** are abundant, and are collected into a superficial and deep set, which perforate the wall of the pharynx, and pass into the upper carotid cervical glands.

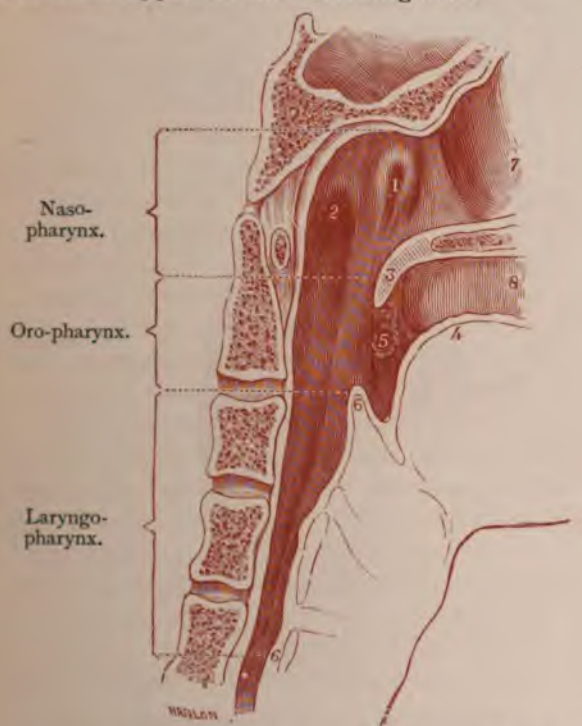


FIG. XIX.—SECTIONAL VIEW OF THE PHARYNX.

1. Left Eustachian tube.
2. ,, Fossa of Rosenmüller.
3. Palate and uvula.
4. Tongue.
5. Left tonsil.
6, 6. Upper and lower boundary of larynx (epiglottis and cricoid cartilage).
7. Cavity of nares.
8. Cavity of mouth.

The **Nerves** come from the glosso-pharyngeal, the fifth, and the sympathetic; also from a plexus surrounding the tonsil, formed by the union of branches from these nerves.

The **Pharynx** (Fig. XIX.), as generally considered in surgical practice, is that portion of the alimentary canal which is seen at the back of the mouth. It really extends from the under surface of the basilar process of the occipital bone above, to a point

opposite the fifth cervical vertebra, and on a level with the cricoid cartilage below, where it is continued as the œsophagus.

The pharynx may be described as a musculo-membranous funnel of from 4 to 5 in. in length, and capable of a considerable amount of expansion and contraction. This funnel is widest

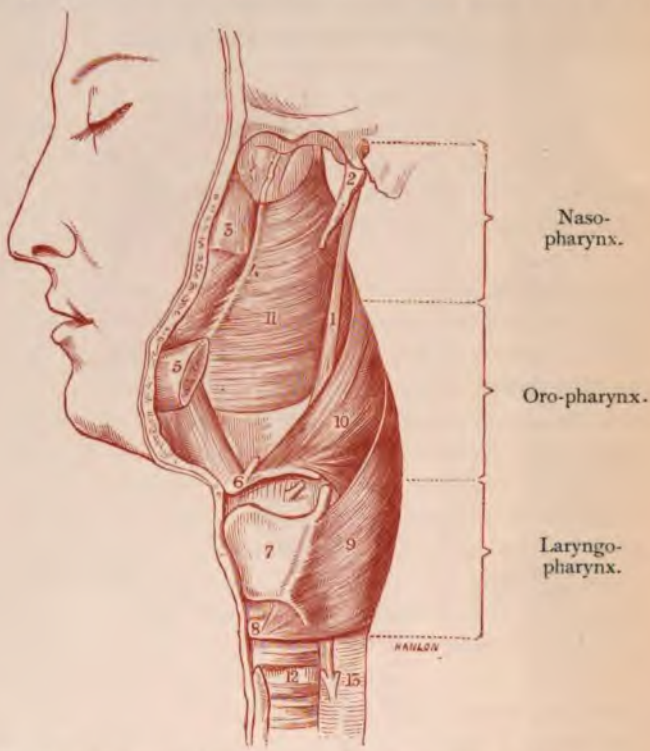


FIG. XX.—SIDE VIEW OF MUSCLES OF PHARYNX (AFTER GRAY).

1. Stylo-pharyngeus.
2. Styloid process.
3. Upper jaw.
4. Pterygo-maxillary ligament.
5. Lower jaw.
6. Hyoid bone.
7. Thyroid cartilage.
8. Cricoid cartilage.
9. Left inferior constrictor (laryngo-pharyngeus.
10. Left middle constrictor (hyo- or oro-pharyngeus).
11. Left superior constrictor (cephalo- or naro-pharyngeus).
12. Trachea.
13. Œsophagus.

above, and is continued upward by a dome-like roof arching from behind forward. The front part of the dome is imperfect. A good comparison is that with a carriage hood having the front window drawn half-way down. Speaking exactly, its greatest breadth is opposite the cornua of the hyoid bone; its narrowest point at its termination in the œsophagus. It is freely movable

in every direction, and is in relation *posteriorly* with the cervical portion of the spinal column as far as the fifth vertebra and its covering; *laterally*, with the external and internal carotid arteries, the internal jugular veins, the vagus, glosso-pharyngeal, pneumogastric, and hypoglossal nerves. *Anteriorly*, its line is broken, first, by communication at its upper extremity with the posterior nares (naso-pharynx); secondly, with the back part of the mouth (oro-pharynx); and thirdly, with the larynx (laryngo-pharynx), from which it is separated by the epiglottis (see Figs. XVIII., XIX., and XX.). Failure of the soft palate and fauces to shut off the naso-pharyngeal portion, or of the epiglottis to protect the larynx, in the act of swallowing, may lead respectively to regurgitation of food through the nose, or its passage into the larynx. Imperfect closure of the naso-pharyngeal space is the cause of nasal tone. Hypertrophy of normal tissues, or fresh formations (enlargements of the pharyngeal tonsil or adenoid growths, polypi, etc.), causing obstruction of that region, lead not only to impediment to healthy respiration through the nostrils, the natural respiratory passages, but also to defective nasal resonance—a very different thing from nasal tone, though the two terms are often wrongly used as interchangeable and similar. Such obstruction of the naso-pharynx is also provocative of deafness; for it is in the nasal portion of the pharynx that communication takes place, by means of the Eustachian tube (Fig. XVIII. 8, 8; and Fig. XIX. 1) with the middle ear.

The pharynx has a strong fibrous investment—the pharyngeal aponeurosis—and a mucous lining continuous with that of the mouth, nares, larynx, and Eustachian tubes. It is covered by columnar ciliated epithelium as low down as the level of the floor of the nares, below which point the epithelium is squamous. It is rich in glandular structure of the acinous and lymphoid kinds; the former are generally disseminated, while the latter are found principally at the upper portion (pharyngeal tonsils) and around the orifices of the Eustachian tubes.

The fossa of Rosenmüller is situated opposite the tip of the petrous bone on each side of the posterior wall of the pharynx. It extends in the form of a cul-de-sac. This fossa is in relation behind with the recti muscles, in front with the Eustachian tubes, above with the sphenoid and petrous bones, and externally with the middle meningeal artery and otic ganglion. It is lined by a soft thick mucous membrane containing many glands and much lymphoid tissue.

Pharyngeal Tonsil.—Although the pharyngeal vault belongs

in a pathological sense to the nasal cavity, yet an account of the remarkable collection of lymphoid follicles and glands, known as the pharyngeal tonsil, forms part of the general descriptive anatomy of the pharynx.

In structure and function the pharyngeal tonsils are closely allied to those in the fauces.

The pharyngeal tonsil, however, instead of being massed or conglomerated, is arranged quite irregularly, sometimes in parallel ridges separated by deep fissures, having a general direction from above downwards, but this or any other symmetrical grouping is decidedly the exception. In the centre of the lower part of the pharyngeal tonsil, where it is about to shade off under the smooth mucous coat of the pharynx, is a small orifice which marks the opening into a pouch-like depression, the **pharyngeal bursa.** This orifice is not always well marked in life, nor is it always demonstrable in the cadaver.

The pharyngeal tonsil is limited on each side by the fossa of Rosenmüller, and ends in front in a more or less distinct ridge, after which the mucous membrane is thin and closely adherent to the under aspect of the basilar process of the occipital bone. Below, the pharyngeal tonsil shades off gradually into the ordinary mucous coat of the oro-pharynx.

The **Eustachian Tonsil** also resembles in structure and function the other tonsils. It is often undistinguishable or inseparable from the pharyngeal. Occasionally it may be defined as supporting the anterior aspect of the triangular space between that body and the posterior extremity of the inferior turbinated bone. It is often enlarged coincidentally with the faucial and pharyngeal tonsils, and may be easily overlooked.

The duties of the pharynx in relation to free nasal respiration, tone-production, and hearing, may, notwithstanding their importance, be considered secondary to its main function—that of carrying the food, after mastication, from the mouth to the œsophagus. This purpose is effected by special muscles, the principal of which are the *stylo-pharyngei* (Fig. XX. 1), the office of which is to elevate the pharynx as it meets the descending food; and the *pharyngeal constrictors*, three in number (Figs. XVIII. and XX. 9, 10, 11).

The first constrictor exposed, and the thickest, is the *inferior* (9), which arises from the sides of the cricoid and thyroid, and spreads backwards and inwards. The *middle* (10), which is smaller than the preceding, is fan-shaped, and arises from the hyoid bone and stylo-hyoid ligament. The *superior* (11),

which is still thinner, and is square in shape, has a wide origin from the sphenoid and palate bones, and from tendinous and ligamentous tissues in the neighbourhood. They are all inserted posteriorly in the fibrous aponeurosis of the pharynx, meeting their fellows of the opposite side, the superior having also an extension of attachment to the basilar process. The position of the pharyngeal muscles is indicated in the wood engravings (Figs. XVIII. and XX.).

Henle calls these three constrictors, inferior, middle, and superior, the *laryngo-pharyngeus*, *hyo-pharyngeus*, and *cephalo-pharyngeus*, from their respective relations to the larynx, the hyoid bone, and the bones of the head. It is simpler, considering that their borders constitute the boundaries of the three portions of the pharynx to which allusion has been made, to call them *laryngo-*, *oro-*, and *naso-pharyngei.*

To terminate properly the description of the pharynx, we must return to its extension downwards, viz. to—

The **Œsophagus** (Fig. XX. 13), which connects the pharynx with the stomach. Commencing at the lower border of the cricoid cartilage, opposite the fifth cervical vertebra, it extends downwards behind the trachea with a slight deviation to the left as far as the root of the neck, and again in the same direction as it passes through the chest, piercing the diaphragm opposite the ninth dorsal vertebra, and terminating in the stomach. It also curves antero-posteriorly in the plane of the spinal column. Its length is nine to ten inches, and its diameter about three-quarters of an inch. At three points, according to Mouton—namely (1) at its commencement, (2) three inches lower, and (3) as it enters the diaphragm—the diameter is lessened, and is not at these situations more than half an inch. Sappey's statements on this head are more generally accepted—namely, that the calibre of the gullet gradually diminishes from its upper commencement till the level of the fourth dorsal vertebra, —about the half of its length,—whence it again as gradually increases to its termination at the stomach. It may therefore be said to be arranged as two truncated cones, united at their apices —as an hour-glass, in fact. The œsophagus is constructed of layers of muscular fibre, striated above, non-striated below, and it is lined by mucous membrane, covered with stratified epithelium. The sub-mucous coat is well marked, and contains, in addition to vessels and nerves, numerous elastic fibres. The tube is surrounded by a sheath of fibrous connective tissue, whose strands blend with the deep cervical fascia.

HISTOLOGY

The **Soft Palate** is covered on both aspects for the most part by stratified squamous epithelium; the cells, however, on its pharyngeal aspect gradually undergo transition to the ciliated columnar variety which extends upwards to the post-nasal region. They are larger on the pharyngeal than on the oral aspect, where they are much more closely packed. At birth, the mucous membrane is covered with ciliated cells, but these soon undergo transformation. Beneath the epithelium is an extensive layer of loose tissue with elastic fibres, which readily accounts for the great liability of the soft palate to œdema. This tissue becomes more compact in an upward direction, as the palatine aponeurosis blends with the palatal muscles. Scattered in it will be seen numerous acino-tubular glands (Fig. XXI.), chiefly mucous, which open on both aspects by short columnar lined ducts, but they occur more frequently at the edge of the soft palate, where they are very numerous and form a special layer, which appears to entirely replace the muscle fibres; there are also fine capillary blood-vessels, medullated and non-medullated nerves, with an occasional Pacinian corpuscle.

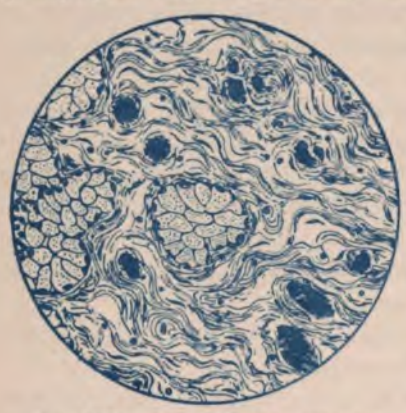


FIG. XXI.—SOFT PALATE, SHOWING MUCOUS GLANDS (⅛ *in. Obj.*).

The **Uvula** microscopically is almost identical with the soft palate. Fig. XXII. illustrates the general arrangement of the structures, representing an antero-posterior section about the centre. It will be noticed that the glands are purely mucous, and are practically restricted to the posterior or pharyngeal aspect, which is the usual arrangement. The muscle is not always arranged in two bundles, and most frequently occurs in several small fasciculi arranged in one group surrounded by somewhat dense perimysium. The fascicles

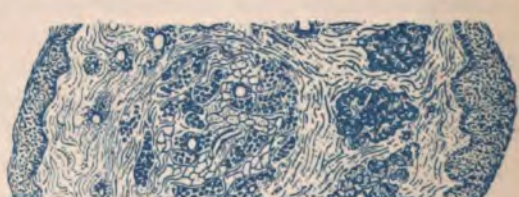


FIG. XXII.—NORMAL UVULA (½ *in. Obj.*).

are separated by loose endomysium devoid of any adipose tissue cells, and the areolar tissue is extremely loose and vascular. The epithelium is of the stratified squamous variety, and is not infrequently the seat of 'pearls' or epithelial nests (Cohnheim's germs).

FIG. XXIII.—NORMAL FAUCIAL TONSIL (1 *in. Obj.*).

The **Faucial Tonsils** are the precursors of a large series of lymphoid structures occurring in the digestive canal, specialised under different names, but possessing striking histological features in common. They may be enumerated as follows:—

1. Faucial tonsils.
2. Lingual tonsils.
3. Pharyngeal tonsils.
4. Discrete, but irregular patches of lymphoid tissue in the stomach.
5. A special nodule situated in the duodenum opposite the entrance of the common duct (the duodenal tonsil).
6. Solitary and agminate masses in the small intestine (Peyer's patches).
7. Vermiform appendix.
8. Solitary glands of the colon.
9. Special patch at junction of the rectum and anus (rectal tonsil).

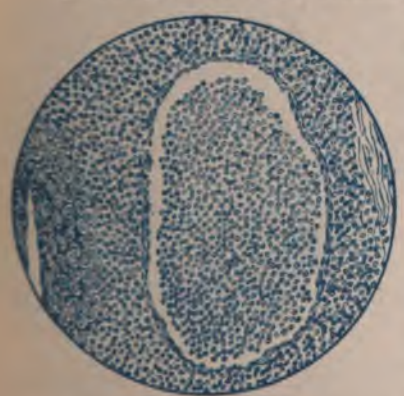


FIG. XXIV.—TONSIL SHOWING LYMPH NODULE WITH PART OF EPITHELIAL LINING OF LACUNA (¼ *in. Obj.*).

(There is also much lymphoid substance in the larynx, *vide* p. 28.)

The **Faucial Tonsils** (Fig. XXIII.) represent masses of differentiated adenoid tissue developed in the wall of the second postoral cleft. They consist of lymphoid tissue distributed in a

special manner. The surface is seen to be studded with small depressions into which open several small lacunæ, each lined with stratified squamous epithelium continuous with that of the surface. Into the fundus of the lacunæ an occasional mucous gland is to be seen, but this type of gland occurs much less frequently than in the lingual tonsils. In this figure, which represents a section cut normally to the surface, it will be noticed that the lymphoid tissue is chiefly distributed in the superficial portion, and does not extend much deeper than the lacunæ. This constitutes a cortical layer, whilst the deeper part or core which rests upon the pharyngeal aponeurosis is composed mainly of loose connective tissue, blood, and lymphatic vessels.

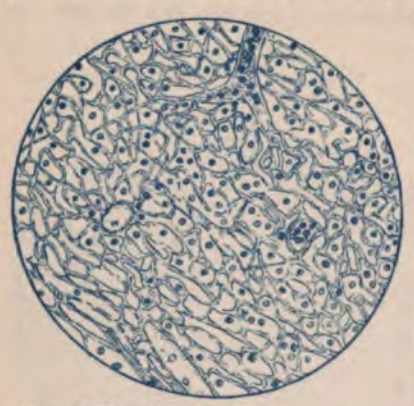
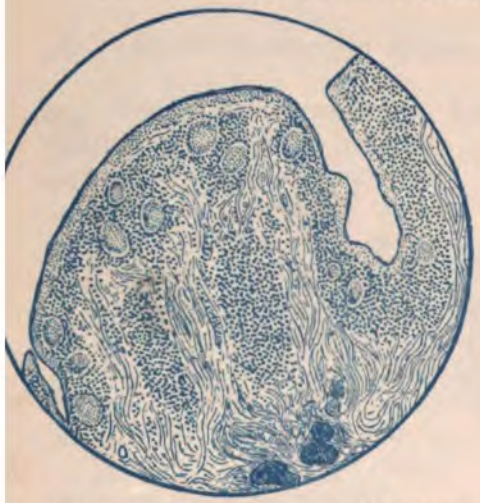


FIG. XXV.—FAUCIAL TONSIL, SHOWING RETICULUM (¼ *in. Obj.*).

The lymphoid tissue evidently consists of two kinds—



IG. XXVI.—THE SUB-PHARYNGEAL CARTILAGE OF LUSCHKA (½ *in. Obj.*).

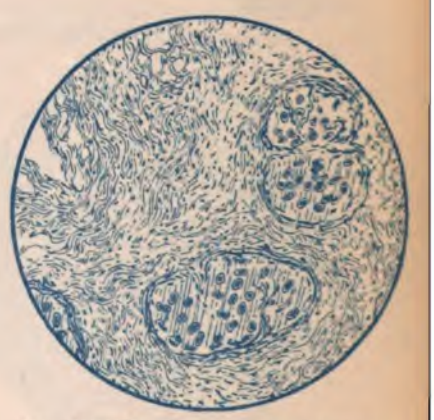


FIG. XXVII.—THE SUB-PHARYNGEAL CARTILAGE OF LUSCHKA (¼ *in. Obj.*).

ordinary lymph pulp and lymph nodules or follicles, and is in this respect strongly suggestive of the spleen. The pulp constitutes the greater part of the tonsil, whilst the nodules in the normal condition occupy a relatively small portion of a section.

They are seen as ten or twelve round or oval masses regularly grouped in the pulp immediately below the walls of the crypts. If stained with hæmatoxylin, they are somewhat paler than the pulp, but they are surrounded by a darker zone, which under a higher power appears to form an indistinct capsule, due to a closer reticulation of the retiform tissue of the pulp (Fig. XXIV.), and forming a space or lymph path. This path is well marked in normal tonsils, especially when dehydrated in alcohol, but is almost entirely lost in morbid conditions, acute or chronic.

The nodules vary so much in size, that they may be considered to be rounded or oval masses, rather than cylindrical cords as in lymphatic glands. They consist of an extremely delicate reticulum, probably continuous with the perivascular sheath of the small arteries, as in the spleen, which is obscured by closely packed lymphocytes whose nuclei are often multiple, indicating active karyokinesis, which supports Fleming's suggestion that they represent foci of cytogenous or cell-bearing tissue. This interpretation is further emphasised by the fact that their activity is markedly increased in acute inflammatory changes. They differ, however, from the Malpighian bodies of the spleen in having a lymph path, and in many other details.

The lymph pulp likewise consists of ordinary lymphoid tissue formed of a delicate reticulum enclosing lymphocytes (Fig. XXV.). But the reticulum is much coarser than in the nodules, and the cells are generally larger, although varying considerably in size and exhibiting mitotic changes in a lesser degree. The reticulum is formed of elongated cells arranged around the ground-substance, forming *Saftcanälchen* or lymph spaces, through whose walls lymph and migratory corpuscles may readily pass from the blood capillaries. Their direct continuity with the lymph path and lymphatic vessels is still a matter of dispute.

It was pointed out by Stöhr that leucocytes migrated from the lymphoid tissue into the crypts *between* the stratified epithelial cells—not *through* them. This is often seen in sections of diseased tonsils, but in the healthy state it is by no means easy of demonstration.

Occasionally the faucial tonsil extends in a downward direction until it appears to be continuous with the lingual. In this inferior part an interesting morphological structure may be demonstrated, namely, the *sub-pharyngeal cartilage*, representing the remains of the third postoral arch. It occurs in the deep core portion of the tonsil, embedded in areolar tissue, as shown in Fig. XXVI.; and is found to consist of ordinary hyaline

cartilage (*vide* Fig. XXVII.). This embryonic vestige is of surgical interest, inasmuch as it constitutes a 'Cohnheim's tumour germ,' and may be the seat of new growths.

The Lingual Tonsil.—Considering the clinical importance of the tongue, and its liability to very obvious and serious diseases, the looseness and incompleteness of its descriptive anatomy in most text-books cause matter for surprise.

This remark applies especially to the posterior part of the tongue, and still more to that—more or less—conglomerate mass of glandular tissue, now termed the **Lingual Tonsil,** the very name of which is unknown to many practitioners, while its clinical importance is deemed by the majority but a pedantic fad of the specialist.

Notwithstanding that the lingual tonsil was minutely described nearly half a century ago, it has escaped notice in most text-books of anatomy, and even now is only briefly alluded to in the latest edition of *Quain's Anatomy.* This neglect has extended not only to works on general surgery, but is conspicuous in special manuals and in special contributions to encyclopædic systems. Such inattention is not justified by any suggestion that the lingual tonsil is unimportant, for it is liable to be attacked by all diseases common to other tonsillar structures, and in such cases its situation is responsible for certain characteristic symptoms which may be of grave moment. It is also the site of disorders peculiar to itself.

Although it is only the posterior part or base of the tongue that comes within the scope of this volume, it will be more expedient to briefly consider the entire organ than to describe only that portion which constitutes part of the anterior and inferior boundary of the pharynx, a region occupying such a prominent position in laryngoscopy, and, as already stated, is responsible for so many minor throat troubles.

The tongue has long been described as consisting of two distinct portions, situated respectively in front of and behind the soft palate (in the passive state), and these have been called by Wyatt Wingrave the *oro-glossus* and the *pharyngo-glossus.* The line of division is practically indicated by the circumvallate papillæ; close behind them and in the centre of the organ is a faint depression representing the *sulcus terminalis,* a groove which in the embryo clearly separates the developmental elements. This apparently arbitrary division is further emphasised by the fact that the parts differ in (1) nerve supply; (2) functions; (3) structure; (4) development.

The **Oro-glossus** is covered entirely by stratified squamous

epithelium, arranged in variously shaped papillæ, each having a vasculo-nervous core. Along the edge are found albuminous

FIG. XXVIII.—ALBUMINOUS GLANDS FROM THE LINGUAL TONSIL (⅛ *in. Obj.*).

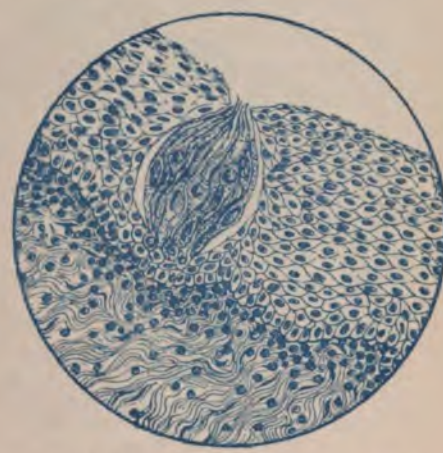


FIG. XXIX.—TASTE BUD (⅛ *in. Obj.*).

and mucous glands (Weber and Blandin), which are sparsely distributed on the dorsum. This region receives its sensation from the lingual branch of the fifth nerve, probably in part also from the glosso - pharyngeal, through the pars intermedia and chorda tympani successively. Its gustatory sensations are specially the sweet, saline, and sour. In the deeper parts Pacinian corpuscles may be found.

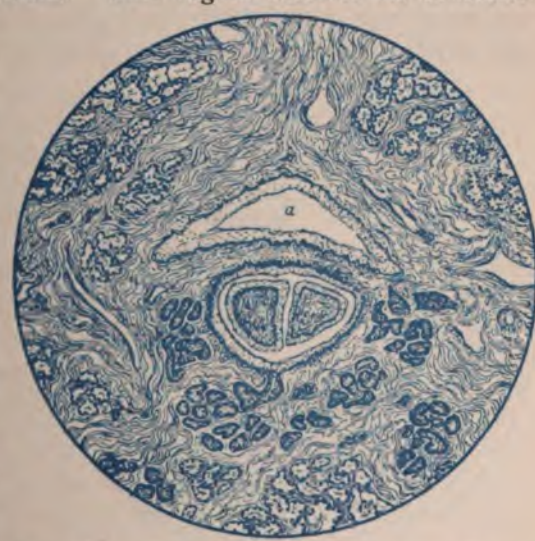


FIG. XXX.—TRANSVERSE SECTION THROUGH FORAMEN CÆCUM (*a*), AND ADJACENT COMPOUND PAPILLA, SHOWING MUCOUS AND ALBUMINOUS GLANDS (½ *in. Obj.*).

The **Pharyngo-glossus** presents an entirely different microscopic appearance from the oral portion, the uniformly regular papillary surface of the latter being replaced by irregular nodular

elevations, some of which exhibit a well-marked umbilication, and are known as the **Lingual Tonsils.** These are occasionally grouped into two more or less symmetrical masses, but it is more common to find them scattered without any definite arrangement.

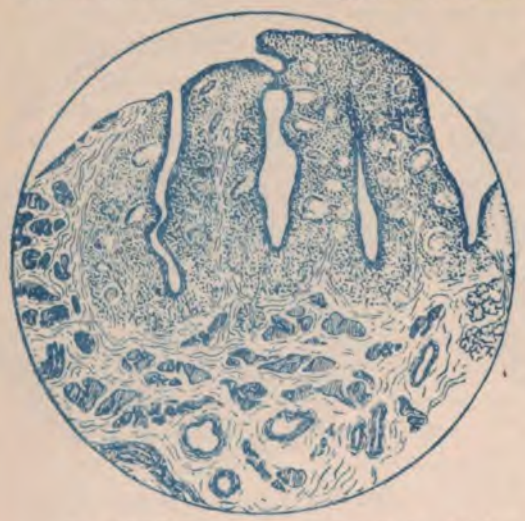


FIG. XXXI.—LINGUAL TONSIL (½ *in. Obj.*).

MICROSCOPICALLY the umbilication is seen to be due to a central crypt or depression of the stratified surface epithelium, which generally receives the duct of one of the numerous albuminous glands (Salter and Henle; Fig. XXVIII.), which abound in this region, and also open between the nodules. Here are sometimes found taste buds (Fig. XXIX.), supposed to be the terminals of the glosso-pharyngeal nerve. These taste buds, however, chiefly occur in the circumvallate papillæ, and in the 'fimbria linguæ,' two rough patches, which are seen on each side of the tongue just in front of the anterior faucial pillars, and are said to morphologically correspond with the '*papillæ foliatæ*' of the rabbit. In the exact centre of the *sulcus terminalis* is seen the *Foramen cæcum* (Fig. XXX.), the opening of the *Hyo-lingual duct* (*a*), which is often patent and may be traced to the hyoid bone, and downwards to the median lobe of the thyroid gland

FIG. XXXII.—CILIATED CRYPTS OF LINGUAL TONSIL (¼ *in. Obj.*).

as the *thyro-hyoid duct.* The upper part of this duct is lined with squamous epithelium, but at its deeper part ciliated cells occur. This duct is of special interest, in that it may be the seat of a cyst especially in the thyro-hyoid portion. Occasionally either the margins of the duct or adjacent compound papilla, as is seen in the section, may be so prominent as to be suggestive of a morbid growth.

The lingual tonsils (Fig. XXXI.) are histologically identical with the faucial. The lymphoid tissue is arranged in a precisely similar manner, but the crypts are not infrequently lined with ciliated epithelium (Fig. XXXII.), and for the most part receive the ducts of albuminous glands. Below the lymphoid layer, skeletal muscle fibres are plentiful, and the cellular tissue is more dense than in the faucial. Moreover, the small lymphoid masses or follicles are less regularly arranged in the walls of the crypts, but are surrounded by well-developed lymph paths.

It is worthy of notice that the veins of the pharyngo-glossal region are very superficial, and are covered by only very thin mucous membrane.

The **Pharyngeal Tonsils** (Fig. XXXIII.), situated below and around the bursa-pharyngea, when enlarged, and stretching across the upper and back part of the pharynx, constitute adenoids or post-nasal growths or 'vegetations.' They are masses of lymphoid tissue, or rather of tissue of a low or embryonic type. They have a strong histological resemblance to the other tonsils, but in many respects they differ. In the first instance they do not appear to be so highly differentiated; they are very irregular in distribution and in shape. Their crypts are ill-defined, for the surface irregularities scarcely deserve that name. They are covered with a single layer of ciliated columnar epithelium with chalice cells. They do not contain any mucous glands in their substance, yet, like the lingual and faucial tonsils, they possess small lymph nodules, arranged as a single row beneath the surface. Fig. XXXIII. shows their distribution, but indicates a greater regularity than is usually found when they are much hypertrophied. This section was taken from a somewhat small example in a child, aged six years.

It will be noticed that the lymph nodules are not so clearly separated, as is the case with their faucial analogues, from the surrounding low type tissues by any well-defined lymph path, and on examination with a high power (Fig. XXXIV.), the sub-epithelial region will be seen to be occupied by closely packed bodies,

doubtless the precursors of the surface cells, mixed with lymphocytes; below this an open reticulum forms wide meshes, which hold large and small lymphocytes, these often containing two or more nuclei. Still deeper, the meshwork becomes much closer, with more numerous typical small lymph cells. In places the interesting condition shown in Fig. XXXV. are found, especially when the adenoids are luxuriant and old. Patches of honeycombed homogeneous colloid-looking substance are seen, enclosed by what is apparently the remains of a lymph vessel, for these channels are for the most part much dilated. This substance is probably fibrinous in origin, the result of thrombotic changes. The reticulum itself also appears to be undergoing a similar degeneration. These conditions may reasonably be interpreted as indicative of a retrograde metamorphosis. They are never seen in either the faucial or lingual tonsils.

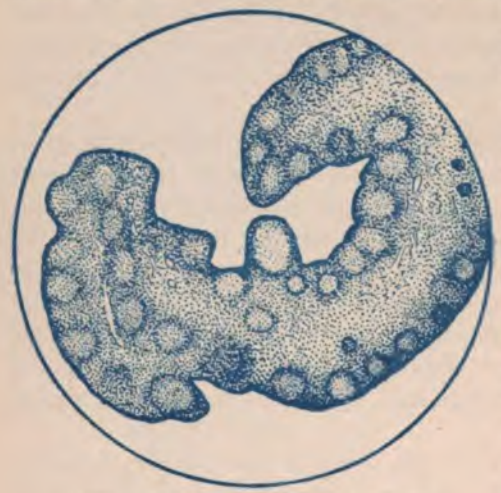


FIG. XXXIII.—PHARYNGEAL TONSIL (1 *in. Obj.*).

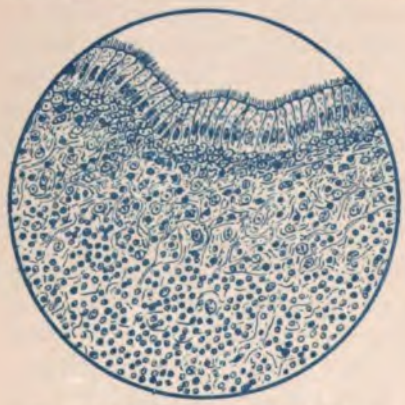


FIG. XXXIV.—PHARYNGEAL TONSIL, SHOWING CILIATED EPITHELIUM OF SURFACE ($\frac{1}{2}$ *in. Obj.*).

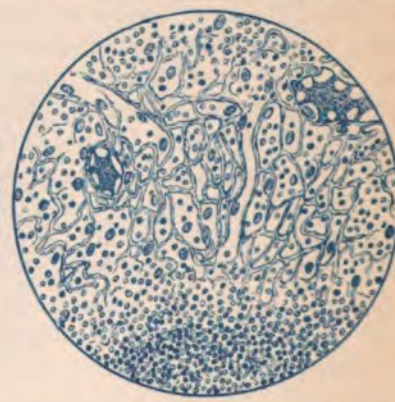


FIG. XXXV.—PHARYNGEAL TONSIL, SHOWING COLLOID DEGENERATION OF RETICULUM ($\frac{1}{8}$ *in. Obj.*).

As might be expected, these structures are highly vascular,

the walls of the superficial vessels being extremely thin. One feature of particular interest is the active migration of the lymphocytes, for these bodies may be seen passing between the ciliated epithelial cells in crowds, so that there can be no doubt whatever as to the genuineness of that phenomenon in this situation.

The **Bursa Pharyngea** is an irregularly shaped pouch of mucous membrane, situated in the middle line of the naso-pharynx, generally over the basi-occipital bone, but it may occur at various levels. It doubtless represents the remains of the pouch of the stomodeum, from which is formed the anterior portion of the pituitary body. It is generally lined with ciliated epithelium, continuous with that of the naso-pharyngeal cavity, and around its opening are scattered mucous glands.

CHAPTER III

ANATOMY, HISTOLOGY, AND PHYSIOLOGY OF THE NOSE.

REVISED BY MAYO COLLIER, F.R.C.S.

THE MINUTE ANATOMY BY WYATT WINGRAVE.

THIS organ consists essentially of two distinct parts—(1) An external, forming a feature mainly of æsthetic importance to the individual, and of clinical interest to the general surgeon and dermatologist; and (2) internal, comprising the nasal fossæ, with which as rhinologists we are more immediately concerned (Fig. XXXVI.).

THE EXTERNAL NOSE

consists of all that portion attached to the maxillary bones, and bony septum, including the triangular cartilage in the centre, the upper and lower lateral cartilages and sesamoid cartilages, which together constitute the framework of the lateral portions or wings of the nose.

The whole is bound together by dense fibrous tissue and skin.

In adults, the opening of the anterior nares is always on a lower level than the floor of the nasal fossæ; the difference sometimes being as much as 3 to 9 mm. This point must be remembered when we are inspecting the nasal fossæ.

On looking into the nostrils with the aid of a good light, the vestibule, or that portion bounded by the cartilages of the nose, is first seen. Usually, a few stiff hairs or vibrissæ spring from the interior of this region. On dilating the alæ, the first object that engages the attention is the limen vestibuli or boundary crescent, separating the vestibule or cuticular from the nasal or mucous cavity; then is presented the inferior turbinal as a smooth, rounded body, of a somewhat ruddier colour than the mucous membrane of the lips. This prominence can be traced horizontally backwards almost to its termination. On a higher plane, another prominence, of less vivid colour—the middle turbinated body—can be seen

situated closer to, and sometimes almost in contact with, the septum. It inclines from before backwards, curving towards the maxilla. Running forwards from its attachment is a crest known as the agger nasi, forming the lower boundary of the olfactory slit.

On a still higher level, *under quite exceptional circumstances*, the superior turbinal body may be sighted.

The **Septum,** or central partition between the nasal fossæ, can be viewed for at least half its depth backwards. It is frequently deflected in adults to one or the other side; this

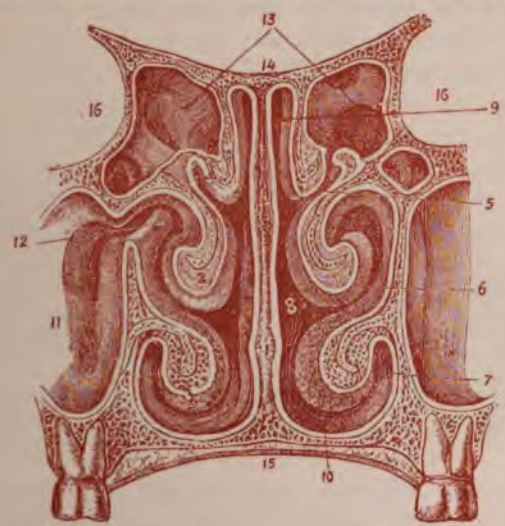


FIG. XXXVI.—ANTERIOR SECTION OF THE NOSTRILS (LUSCHKA).

1. Septum of the nares at position of tubercle.
2. Middle turbinated body.
3. Inferior turbinated body.
4. Superior turbinated body.
5. Superior meatus.
6. Middle meatus.
7. Inferior meatus.
8. Respiratory portion of the nares.
9. Olfactory portion.
10. Floor of the nares.
11. Cavity of right antrum.
12. Opening from antrum to nostril.
13. Ethmoid cells.
14. Roof of the nasal fossæ.
15. Floor of the nasal fossæ.
16. Cavity of orbit.

deviation not necessarily constituting a morbid quality. The openings of the infundibulum, of the nasal duct, and of the antrum of Highmore are not visible in the normal.

A consideration of certain more minute points in the anatomy of the nares, such as Jacobson's organ, will be found included in the Histology.

Cartilages of the Nose. — The **Triangular or Septal Cartilage** (Fig. XXXVII. 1) forms the partition of the vestibules, and is attached to the crest of the nasal bones, to the per-

pendicular plate of the ethmoid bone, to the vomer, and to the palatal process of the superior maxillary bone.

The **Upper Lateral Cartilage** is attached to the nasal bone, superior maxillary bone, septal cartilage, and lower lateral cartilage or cartilage of the aperture (Fig. XXXVII. 3). This last forms part of the septum columella and tip of the nose, as well as its lateral wings. The remaining portion of the alæ is formed by cellular tissue, fat, and a few little sesamoid cartilages.

Muscles of the Nose.—Two sets of muscles preside over and regulate these valve-like openings during the act of forced and special voluntary inspiration, the first as seen in dyspnœa, the second in the act of 'sniffing' in olfactory efforts.

The muscles are seven in number, and have been divided into two sets, the **Dilators** and **Constrictors** of the anterior nasal openings; the former being further subdivided into the ordinary and the extraordinary muscles of nasal respiration.

The ordinary dilators are the *dilator naris anterior* and *dilator naris posterior.*

The reserve or extraordinary muscles are the *pyramidalis nasi* and *levator labii superioris alæque nasi*, no insignificant or feeble structures.

The **Compressors** or **Constrictors** are represented by the *compressor nasi, the compressores narium minor*, and *depressor alæ nasi.*

The functions of these muscles are represented by their names; and it need only be further said that the power of the dilating muscles is far greater than that of the constrictors. Their importance in preserving the patency of the nasal apertures is seen in cases of facial paralysis, apoplexy, and deep chloroform narcosis. In all these conditions the muscular palsy leads to a valve-like collapse of the nostrils during inspiration, so that breathing is compulsorily carried on by means of the mouth. To this may be added alar collapse secondary to nasal obstruction, by which intrinsic muscular development is arrested.

The Nasal Fossæ,

constituting the internal nose, consist of two wedge-shaped cavities divided by a partition or septum.

The **roof** (Fig. XXXVII.) is represented by the cribriform plate of the ethmoid, which is approached from the front by a narrow slit—the olfactory.

The **floor** is formed by the horizontal processes of the

superior maxillary and palate bones. In its mucous membrane is found some glandular and erectile tissue; otherwise it is thin and closely adherent to the bone.

The fossæ are continuous anteriorly with the vestibule and nose proper, and posteriorly with the naso-pharynx by the posterior nares. The interior of the nasal fossæ contains not only

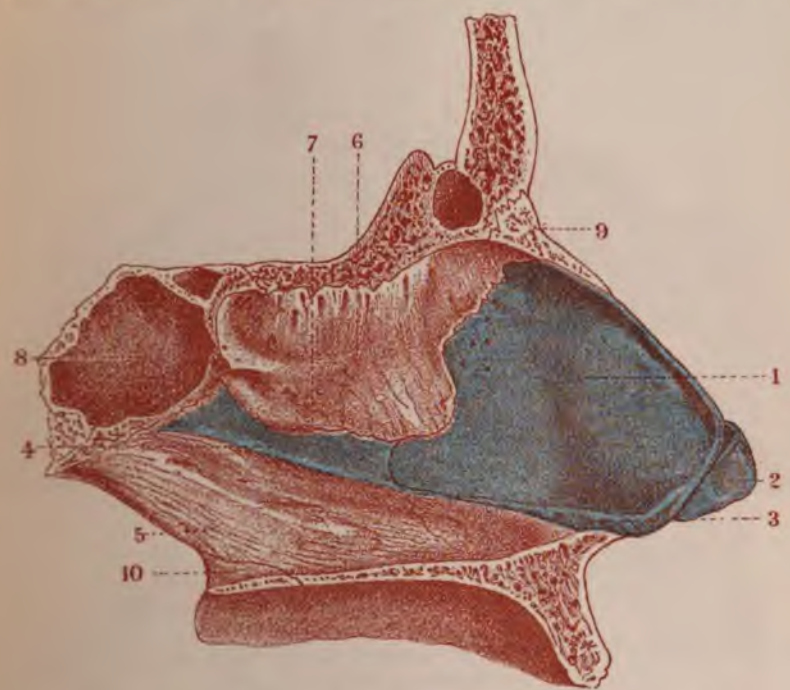


FIG. XXXVII.—OSSEOUS AND CARTILAGINOUS SEPTUM OF THE NOSE, SEEN FROM THE SIDE (ARNOLD).

1. Cartilage of septum.
2. Cartilage of aperture.
3. Cartilage of Jacobson.
4. Posterior process of cartilage of septum or Supra-vomerine cartilage.

Tinted blue.

5. Vomer.
6. Lamina perpendicularis.
7. Ethmo-vomerine suture.
8. Sphenoidal sinus.
9. Nasal bone.
10. Palate bone.

the organ of smell, but also an elaborate arrangement for warming, filtering, and moistening the air on its passage to the lungs.

Practically, each nasal fossa is divided into two regions or departments, an upper or olfactory, and a lower or respiratory region, each division containing an arrangement for carrying on its separate function.

The **Olfactory Region** is limited to the upper half or third of the septum, to the roof, and to the upper turbinal body.

Leading into the nasal fossæ, and communicating with them by narrow passages, are several large cavities or chambers, notably the frontal sinus and the antrum of Highmore, with

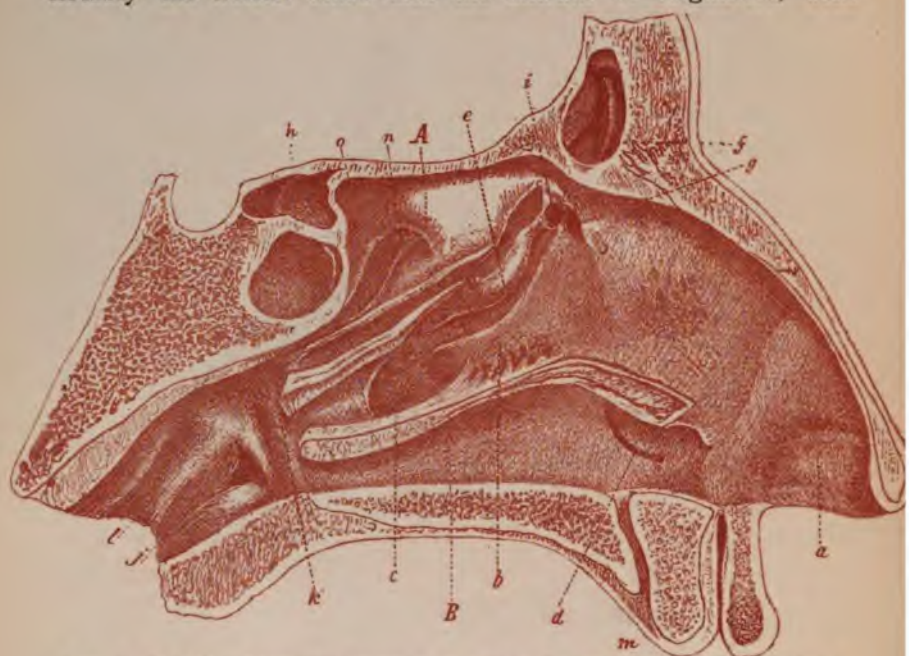


FIG. XXXVIII.—SAGITTAL SECTION, SHOWING OUTER WALL OF NASAL FOSSÆ (ZUCKERKANDL).

The Inferior and Middle Turbinals have been removed.

A. Roof.—Line pointing to superior turbinal.

B. Floor.—Line pointing to inferior turbinal.

a. Vestibule, bounded posteriorly by the lumen; *b*. Hiatis semilunaris; *c*. Ostium maxillare; *d*. Nasal duct; *e*. Bulla ethmoidalis; *f*. Frontal sinus; *g*. Infundibulum; *h*. Sphenoidal sinus; *i*. Aperture of aut-ethmoidal cells; *j*. Eustachian orifice; *k*. Naso-pharyngeal boundary or crest, also marking middle turbinal; *l*. Rosenmüller's fossa; *m*. Naso-palatine canal; *n*. Posterior-ethmoidal cells; *o*. Superior meatus.

several smaller spaces existing in the ethmoid and sphenoid bones, known as the **Ethmoidal** and **Sphenoidal sinuses.**

Each nasal fossa presents for examination an inner and outer wall; a very narrow roof, formed by one half of the cribriform plate of the ethmoid bone; and a somewhat wider floor, formed by the palatal processes of the superior maxillary and palate bones.

The **Inner Wall** or **Septum** (Fig. XXXVII., etc.) is very thin in front and towards the middle. It is partly cartilaginous,

and is formed by the vomer behind, the triangular cartilages of the nose in front, and above by the perpendicular plate of the ethmoid bone, and the spine of the frontal bone.

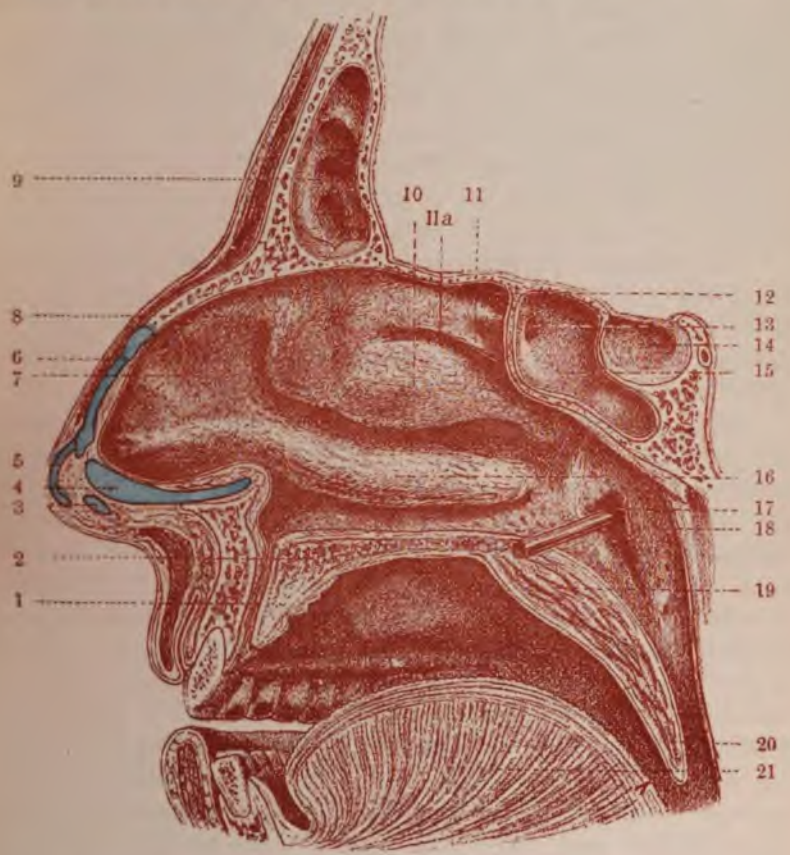


FIG. XXXIX.—SAGITTAL SECTION OF SKULL, JUST TO THE RIGHT OF THE SEPTUM, SHOWING RIGHT NASAL FOSSA.

(AFTER SCHÄFER, Quain's *Elements of Anatomy*, vol. iii. pt. 3.)

1. Incisor canal; 2. Hard palate; 3 and 4. Parts of median crus of the cartilage of the aperture; 5. Anterior part of the same cartilage; 6. Cartilage of the septum; 7. Groove leading to middle meatus; 8. Aagger nasi; 9. Frontal sinus; 10. Inferior ethmoidal concha; 11. Superior ethmoidal concha; 11a. Superior meatus or ethmoidal fissure; 12. Recess of upper meatus; 13. Entrance to sphenoidal sinus; 14. Pituitary fossa; 15. Sphenoidal sinus; 16. Inferior turbinal (maxillary concha); 17. Rod passed into Eustachian tube; 18. Salpingo-pharyngeal fold; 19. Soft palate; 20. Uvula; 21. Tongue.

It is covered by a thin, closely adherent mucous membrane, and contains in its upper half branches of the olfactory nerve; and below, a variable amount of loose cavernous tissue.

The **Outer Wall** (Fig. XXXVIII.) slopes downwards and outwards, and is formed in front by the nasal process of the superior maxillary and lachrymal bones; behind, by the vertical plate of the palate bone, and the internal pterygoid plate of the sphenoid; in the centre, by the ethmoid, inner surface of the superior maxillary, and inferior turbinated bones. From the outer wall there stand out, towards the septum, three scroll-like shelves or ledges, the three turbinal bodies (Fig. XXXIX.).

These projections are curved upon themselves, and are so arranged as to increase the surface of mucous membrane in the nose, without obstruction to nasal respiration.

The Superior Turbinated Bone (*concha suprema*) is the smallest of the three, and descends vertically from the under surface of the cribriform plate, to form between its outer surface and the slanting exterior wall of the nasal fossa the **superior meatus** of the nose, into which the sphenoidal sinus opens.

Below this the **Middle Turbinated Bone** (*concha media*) stands out more prominently, extending farther, from before backwards, than the superior. It inclines anteriorly towards the septum, and its lower outwardly curved border, covered with mucous membrane, forms a prominent feature in rhinoscopy. Its concavity looks downwards and forwards, and forms the middle meatus, in which (on removal of a portion of the bone) may be seen a curved depression, the *hiatus semilunaris*. The upper extremity of this groove is directed towards the *infundibulum*, whilst its concavity is overhung by the *Bulla Ethmoidalis*—a prominence corresponding with one or more of the ethmoidal spaces. Opening into the hiatus semilunaris may be seen the aperture of the *anterior ethmoidal* spaces, and the *maxillary antrum* at variable distances from each other, sometimes a common orifice. Above the Bulla are the openings of the *middle ethmoidal* cells. It not unfrequently happens, as pointed out by Zuckerkandl, that there may be three or four ethmoidal conchæ in all; the commonest variation, however, is an apparent division of the superior.

The **Inferior Turbinated Bone,** or *maxillary concha*, is much larger than the middle one. Its surfaces are nearly vertical, and it extends from before backwards, from the anterior to the posterior nares. It is covered by a thick elastic mucous membrane filled with erectile tissue. The space under the inferior turbinated bone is the **inferior meatus** of the nose, and gives opening to the **nasal duct.**

The **Accessory Sinuses** have their openings into one or other of the upper passages.

The **Antrum of Highmore** or *Sinus Maxillaris* is an irregularly pyramidal space occupying the interior of the superior maxillary bone. Its inner wall, which is vertical, and extremely thin, forms part of the outer wall of the nose.

In the disarticulated state, the **inner wall** presents a large triangular orifice towards its upper and back part, the *ostium maxillare*, opening into the middle meatus. This aperture in a recent specimen is diminished to quite a small orifice, by the encroachment from above of the uncinate process of the ethmoid bone; behind, by the palatal process of the palate bone; below, by the inferior turbinated bone; and in front, by the lachrymal bone. The **upper wall** or roof forms the floor of the orbit; it is very thin, and is pierced by the canal for the infra-orbital vessels and nerves. The **posterior wall,** which is thicker and tuberous, forms the anterior boundary of the pterygo-maxillary fossa. Its **anterior wall,** which looks downwards and forwards, forms part of the face, being continuous with the malar bones.

The maxillary sinus rests upon that part of the alveolar process which contains the three molars, sometimes the bicuspid teeth; and it is occasionally perforated by one or more of their fangs. It is lined by a thin, closely-adherent mucous membrane, continuous with that of the nose.

The Ethmoidal Sinuses.—The anatomy of these sinuses can be more readily appreciated by reference to the lateral masses of the disarticulated ethmoid bone. Here are seen a number of cavities or spaces, bounded externally by the os planum, and mesially by the middle and upper meatus. These cells are open in front and behind, but in the recent state are closed in by the frontal, lachrymal, and sphenoid bones respectively.

The ethmoidal cells may, for the purpose of description, be divided into the anterior, middle, and posterior groups.

The **Anterior Ethmoidal Cells,** and the frontal sinuses through the infundibulum, open into the middle meatus. The nasal opening of the infundibulum is situated above and behind the hiatus semilunaris; that of the **anterior** ethmoidal cells, in the hiatus itself; that of the **middle,** farther back behind and above the bulla; while the **posterior** open into the forepart of the superior meatus; these last sometimes also communicate with the sphenoidal cells.

The **Frontal Sinuses** are situated between the tables of the frontal bone, and are most irregular and uncertain in external appearance and in capacity. They are not developed until the seventh year, and are occasionally absent in adult life.

The frontal sinus extends into the inner and upper wall of the orbit, and sometimes becomes so merged with the ethmoid and maxillary spaces as to form one infractuous cavity. The two sinuses are as a rule separated by a long septum, which, normally in the middle line, presents almost as many deviations in direction as does the septum of the nose. Posteriorly, the sinuses are divided from the brain by an extremely thin lamina of bone, and perforation of this may easily take place either as a result of morbid process or during a surgical operation.

The **Infundibulum,** — so called, — although arbitrarily described in text-books as a well-defined canal, represents in point of fact the channel of communication between the frontal sinus and the anterior ethmoidal cells. Its direction is, as a rule, downwards, backwards, and outwards from the frontal sinus, into the fore part of the middle meatus.

The **Sphenoidal Sinuses** are situated immediately behind the upper meatus, and are more or less separated from each other by a thin plate of bone. They occupy the body of the sphenoid, and sometimes extend into the basilar process of the occipital bone. The central partition is seldom vertical, and the spaces themselves are symmetrically subdivided.

Each sinus is partially separated from the corresponding meatus by a thin irregular plate of bone—the sphenoidal turbinated. A probe may sometimes be passed through the opening, thus demonstrating a communication between this sinus and the nasal cavity. The roof of each sphenoidal sinus at one spot is only separated from the anterior cerebral fossa, and consequently from the brain, by a lamina of bone of from only 1 to 2 mm. in thickness; hence operations in this region must be conducted with special care.

The topography of the various parts of the nasal fossæ, as seen from the posterior orifice in the naso-pharynx, will be described in the portion treating of the art of rhinoscopy.

The **Arteries** supplying the nasal fossæ are numerous. Branches from the ophthalmic artery supply the roof, upper part of the septum, outer wall, and frontal sinus. The internal maxillary supplies by its spheno-palatine branches the septum, meatus, and turbinated bones. The cartilage of the septum is supplied by the artery to the septum, a branch of the superior coronary. The arteries of the nose form a close and compact network, covering every portion of the nasal cavities; hence the profuse hæmorrhage during operations, and from injuries to these parts.

The **Nerves** of the nasal fossæ are of two kinds, special and ordinary.

(1) The **Olfactory,** or special nerve of the sense of smell, consists of about twenty-five olfactory threads from the under surface of the olfactory bulb. These descend to the nose, sheathed in processes of the dura mater, through the foramina in the cribriform plate. The greater number of these filaments pass through an outer row of perforations; fewer through an inner row. The fibres of the outer row are divided into two sets—the posterior going to the upper turbinal, and the anterior to the anterior part of the olfactory groove; while others are distributed to the roof. The nerves form a close network on the bones, and branches proceed to end in the olfactory mucous membrane. Each nerve fibre is non-medullated, and is accompanied by a peri-neural lymph-sheath, by which the lymphatic tissues of the olfactory region are directly continuous with the subdural and subarachnoid lymph spaces.

In addition to the olfactory nerve, the *interior* of the *nasal fossæ, post-nasal* space, and *accessory cavities* are supplied by a close network of **ordinary** nerves of **common sensation,** chiefly derived from the upper two divisions of the fifth nerve, with the spheno-palatine or nasal ganglion.

These nerves act as complements to the olfactory, as is evidenced by the fact that loss of ordinary sensation is generally attended with loss or impairment of the sense of smell (see Chapter X.).

An accurate knowledge of the exact distributions and connections of these nerves is also of much importance, in view of the fact that neuralgia, headache, and other abnormal cephalic sensations, affections of the eyes, of the skin, and of the face, more especially that of the nose, are constantly found associated with disease in the nasal or accessory cavities. Cough, asthma, and various other reflex respiratory troubles may also be often attributable to an abnormal state of the area of distribution of these common sensory nerves.

(2) As to the **Ordinary,** there are two groups—(*a*) the **Ophthalmic**, and (*b*) the **Maxillary.**

Of the branches derived from the ophthalmic or upper division of the fifth nerves, the largest and most important is the **Nasal;** and its distribution will explain the reflex watering of the eyes during operations or irritation of the anterior part of the nasal septum, outer wall, or floor of the nose.

This nerve is given off from the main trunk of the

ophthalmic in the cavernous sinus. Traversing the orbit, which it enters through the sphenoidal fissure, it re-enters the cranial cavity. Lying upon the cribriform plate of the ethmoid bone, it next descends in a slit, close to the crista galli, at the forepart of the plate, to the roof of the nasal cavity, immediately behind the nasal bone. Here it divides into two branches, an inner, the ramus septi, and an outer, the external or superficial nasal, supplying the *integument of the side of the nose* and the *vestibule*.

The branch to the septum extends to the lower and forepart of the partition, supplying the *pituitary membrane*.

The superficial branch descends in a groove in the posterior aspect of the nasal bones, passes forward between the lower margin of that bone and the lateral cartilage, to be directed to the tip of the nose beneath the compressor naris muscle. Before quitting the nasal cavity, this nerve gives off several filaments to the forepart of the *outer wall of the nasal fossæ*, which extend as far as the lower spongy bone.

Finally, according to Luschka, a branch nerve passes through the posterior ethmoidal foramen, and ramifies in the mucous membrane of the *ethmoidal sinus* and *posterior ethmoidal cells*.

(*b*) The greater nasal area is supplied by the second or **maxillary** division of the fifth nerve, with the spheno-palatine or nasal ganglion.

The superior maxillary nerve leaves the skull by the foramen rotundum, and traverses the spheno-maxillary fossa to the infra-orbital canal. It leaves this canal below the lower eyelid, and distributes branches to the *side of the nose, eyelid, lips, and face*, and a short account of all of them is demanded.

1. A *temporo-malar branch* distributed to the skin over the *malar bone and temporal region*. Neuralgic pains are frequently felt here in ethmoidal disease.

2. *Branches* from Meckel's ganglion to the *nose and palate*.

3. Dental and antral branches. The toothache often experienced after operations for nasal polypi is referable to irritation of these nerves.

The posterior and larger of the branches enters the post-dental canal, and, giving off a communication to the interior dental, is distributed to the *molar teeth* and lining membranes of the *maxillary sinus*. The anterior dental nerve gives a branch to the *lower meatus* of the nose and *lower spongy bone*. It is given off from the trunk of the nerve in the infra-orbital canal, and enters a special canal in front of the antrum of Highmore. It then divides into two branches, an inner and outer; the inner supplies the

incisor teeth, the anterior half of the lower meatus and spongy bone, and joins, above the incisor teeth, with a branch of the posterior nasal from Meckel's ganglion. At this point there is a ganglioform swelling—the ganglion of Bochdalek—from which pass branches to the *gums* and *alveolar processes* of the *canine* and *incisor teeth*.

4. An infra-orbital branch, which ends under the elevator of the upper lip, distributing twigs to the *lower eyelid*, *upper lip*, *skin*, *and muscles of the nose*. Here the nerve joins with branches of the nasal nerve.

The remaining nervous supply of the nose and post-nasal space is almost entirely derived from branches of the nasal or spheno-palatine ganglion.

This ganglion is situated in the spheno-maxillary fossa, being suspended from the superior maxillary nerve by its two spheno-palatine branches.

The roots of origin are derived as follows:—

(*a*) *Motor*, from the seventh nerve through the vidian; (*b*) *sensory*, from the fifth; (*c*) *sympathetic*, from the carotid plexus.

The ganglion gives off four sets of branches, which pass upwards, downwards, inwards, and backwards, and are mostly distributed to the nose, palate, and mouth. They are:

1. An *ascending* set to the periosteum of the orbit and to the ophthalmic ganglion and ciliary nerves, so establishing another close communication between the eye and nose.

2. *Descending* branches three in number, and known as the large, small, and external palatine nerves.

The *large* palatine nerve descends in the palatine canal, and is distributed to the mucous membrane of the hard palate, the glands and gums, and joins in front with the naso-palatine nerve. When entering the palato-maxillary canal, this nerve gives a nasal branch which is distributed to the middle and lower spongy bones. A little before leaving the canal this nerve supplies another branch to the lower spongy bone. These are the inferior nasal branches.

The *smaller* palatine nerve and the *external* palatine nerve are distributed to the palate, tonsil, and uvula; the external may be wanting.

3. A set going *inwards*, which comprises the naso-palatine nerve and the upper internal nasal nerves, all of which ramify in the mucous lining of the nasal cavity and adjoining sinuses.

The *naso-palatine* nerve—nerve of Cotunnius—arises from the inner side of the ganglion, and, crossing the roof of the nasal cavity, passes forwards and downwards on the *septum* between

the *periosteum* and *mucous covering*. The nerves of both sides descend to the palate by the foramen of Scarpa behind the central incisor teeth, and, after joining in a fine plexus with the palatine nerve, are distributed to the *papillæ* behind the *incisor teeth*.

Several small branches are distributed to the *septum*; the upper and internal nasal, passing inwards to the *upper* and *posterior part of the septum*, to the *upper spongy bone*, and to the *posterior ethmoidal cells*, whilst another branch passes to the wall of the *maxillary sinus*, and joins with the anterior dental nerve at the ganglion of Bochdalek.

4. Posterior or pharyngeal branches supply the *post-nasal space*, including the Eustachian tube.

HISTOLOGY.

The **Nasal Fossæ** form part of the original involution of buccal epiblast or stomodeum, having in the first instance included the oral cavity, and reached as far as the septum of the pharynx, where communication was established with the foregut. Subsequently excluded from the mouth by the development of the hard palate and inter-maxillary bones, they were divided in the median line by the nasal septum, which was formed in the ethmo-vomerine plate, a continuation of the basi-cranial cartilage. Although originally lined with ciliated cells, the epithelium underwent a differentiation into three kinds—(1) cutaneous; (2) ciliated or respiratory; (3) special or olfactory.

Before dealing with the minute structure of the mucous membrane, it will be expedient to roughly consider the development of the skeletal walls, since this has an important bearing on the morbid anatomy of the organ. If a sagittal section of the skull at birth be made, slightly to one side of the median plane —Fig. XXXVII., from the adult, may be employed for comparison—the nasal septum will be seen to consist of two parts—

1. An inferior, or arrowhead-shaped bony portion, apparently growing upwards in the perichondrium in two layers, which gradually absorb the intervening ethmo-vomerine cartilage and becomes the *vomer*.

2. A superior, somewhat quadrilateral-shaped area, composed of hyaline cartilage. Just behind its centre a white bony nodule will be seen, which, gradually spreading, forms the perpendicular plate of the ethmoid, leaving, however, a large anterior portion entirely free from ossification, the permanent cartilaginous septum. Thus it will be seen that the permanent septum consists

of three distinct parts—two bony and one cartilaginous. Of the bony, one, the vomer, is formed of *two* laminæ in membrane; the other, the perpendicular plate of the ethmoid, is formed as a *single* layer in cartilage, whilst the rest of the septum remains unchanged. It is obvious that with such a complicated process of development, and surrounded as it is by other rapidly growing structures, the nasal septum is peculiarly liable to irregularities in formation, such as spurs and deviations, trophic or traumatic in origin. Between the vomer and the mesethmoid, a strip of the original cartilage (Fig. XXXVII., 4)—the supra-vomerine—often persists, extending backwards from the permanent triangular cartilage. This explains the presence of cartilage in 'spurs' removed from this situation.

At first the floor of the nostril is not rigid, for the sutures between the several elements (palate, maxillæ, and pre-maxillæ) are wide, and are filled in simply with soft connective tissue, on

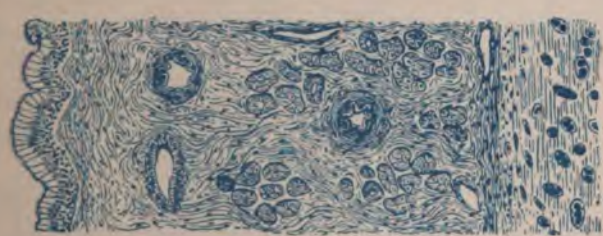


FIG. XL.—NASAL SEPTUM (½ *in. Obj.*).

which the vomer rests, an important provision which allows uniform growth of *all* the elements. Should, however, solidification in these sutures occur too soon, it will materially interfere with the growth of the septum, causing it to be deflected or crumpled. Potiquet believes that 'this defect of harmony between the development of the septum and of its osseous environment is the chief cause of septal deviations.' He also describes a pair of bones, the 'sub-vomerine,' which, placed between the intermaxillary bones, form a gutter-like crest to receive the anterior end of the vomer. Should they develop irregularly, spurs may result.

Thus we have two important situations where spurs may arise from developmental anomalies, viz. (1) the junction of the upper border of the vomer with the mesethmoid plate (or persistence of a supra-vomerine cartilage); and (2) the union of the maxillary crest with the lower border of the vomer.

A description of the septum would be incomplete without

reference to the *organ of Jacobson*, a structure of high development in the lower vertebrates, which, notwithstanding that it may be demonstrated once in every four or five investigations, is generally considered to be only of vestigial interest in man. It consists of a short tubular sac, partly bounded by a plate of hyaline cartilage, and receiving twigs of the olfactory nerve. Its average situation, according to Kölliker, is on the anterior inferior surface of the septum, 8.5 mm. above the floor of the nasal cavity, and 24 mm. from the junction of the membranous septum and the lip. It is about 5 mm. in depth, and can be found just above the cushion formed by its cartilage. The aperture is generally guarded by a flap or valve of mucous membrane, so can rarely be demonstrated without the use of a probe, which on entering passes somewhat upwards and backwards. It is generally symmetrical. The structure must not be confused with the *tubercle of the septum*, which, also a vestige of a more prominent structure in the lower vertebrates, is placed much higher, and consists of a distinct thickening of the mucous membrane.

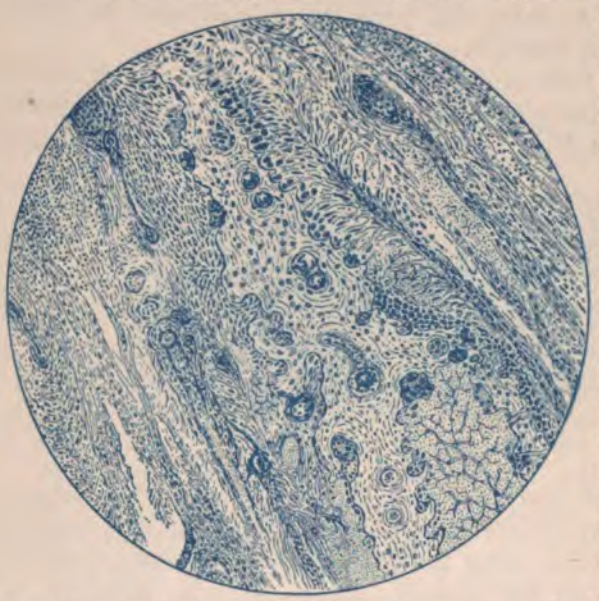


FIG. XLI.—CANCELLATION OF MIDDLE TURBINAL, SHOWING OSTEOCLASTS (¼ *in. Obj.*).

Potiquet considers that the organ of Jacobson possesses considerable clinical interest, since it corresponds with the seat of certain morbid changes, *e.g.* perforating ulcers, necrotic lesions, such as are seen in lupus, typhoid, leprosy, and typhus. It predisposes to inflammatory changes, being a blind sac, and favours the accumulation of bacteria of all kinds.

The turbinal bones are developed endo-chondrially, ossification taking place very early, so that they are prominent structures even at birth, whilst the septum is still cartilaginous. This may

be a point of no small importance, should the inferior turbinal be disproportionately large, as is often the case in childhood. The bone, as laid down at first, consists of numerous small spaces containing large multi-nucleated osteoclasts and blood-vessels, surrounded by bony walls (Fig. XLI.). These spaces rapidly expand, owing to absorption of the walls by the osteoclasts; thus a process of cancellation, or osteoporosis, is constituted, which continues through life in a gradually diminishing degree of activity. As the superficial spaces enlarge, the mucous membrane follows the depressions, and so the ethmoidal bony cells, which are not marked until the third year, are formed. It is difficult to say when the turbinal bones are fully developed; but certainly not before the age of puberty. At that period the bone is seen to consist of very thin ossified plates forming irregular cancelli, and containing arteries, veins, and a varying amount of loose areolar tissue, with wide meshes embedded in a mucine-yielding matrix (Fig. XLII.).

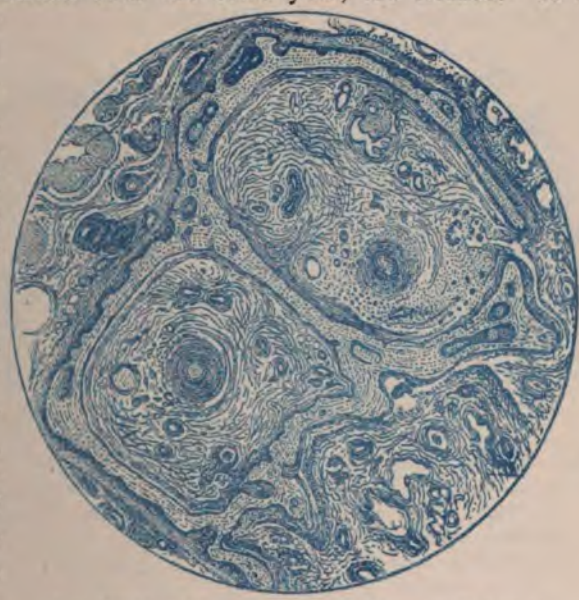


FIG. XLII.—CANCELLATION OF MIDDLE TURBINAL ($\frac{1}{2}$ *in. Obj.*).

These cancelli gradually increase in size, probably owing to absorption, partly by pressure and partly through the action of osteoclasts, which are seen embedded in the bony walls. In certain morbid states these bodies are very numerous, and constitute an important factor in the disease.

The **Nasal Mucous Membrane** is bounded posteriorly by the naso-pharyngeal fold which marks its termination. In front of this, three distinct regions may be defined—

1. An anterior and lower region, lined by purely cutaneous structures, extends as far backwards as the naso-palatine canals, and a curved elevation, the *limen vestibuli*. This region, con-

stituting the vestibule and ventricle, is lined by stratified squamous epithelium. In it are large hairs (*vibrissæ*), sebaceous and sweat glands, which rapidly diminish in size and number as the limen is reached, where the epithelium becomes transformed to the ciliated variety, and the glands become compound mucous in type.

2. **Schneiderian Membrane.** This occupies a region bounded in front by the limen vestibuli, posteriorly by the naso-pharyngeal fold, and superiorly it extends over the greater part of the middle turbinal. It is continued also into the adjacent sinuses, where it becomes somewhat thinner and more simple in structure. Whilst

FIG. XLIII. — MUCOUS MEMBRANES FROM INFERIOR TURBINAL, SHOWING CAPILLARY ARRANGEMENT IN HYALINE MEMBRANE AND VENOUS RADICLES (⅛ *in. Obj.*).

FIG. XLIV. — MUCOUS MEMBRANES FROM INFERIOR TURBINAL, SHOWING CONNECTION BETWEEN VENOUS RADICLES AND DILATED VENOUS SPACES (½ *in. Obj.*).

presenting general features which are common to the whole of this area, certain regions possess special features.

Fig. XL., already referred to, shows the general arrangement. The surface is covered by ciliated columnar epithelium, which in places is mixed with 'chalice cells,' resting on closely packed basal cells. Lymphocytes can readily be demonstrated wandering between these cells. Next in order appears a bright homogeneous hyaloid membrane, which resists the action of hæmatoxylin, but stains deeply with rubin. Under a high power (Fig. XLIII.) this membrane is seen to consist of a translucid ground substance, traversed by minute capillaries, arranged as a delicate plexus parallel with the surface.

These vessels in the injected specimen are seen to be continuous

on the one hand with minute arteries, and on the other with venous radicles possessing very thin walls, which can be traced downwards towards the large veins or venous spaces (Figs. XLIII. and XLIV.).

A layer of loose retiform tissue now follows, consisting of white or gelatine fibres and connective tissue corpuscles embedded in a matrix of mucin. This tissue is extremely like that of a so-called mucous polypus, as will be later discussed. In some regions the cells are so numerous as to constitute lymphoid tissue; but the arrangement never assumes a defined shape as in the tonsils, *i.e.* there are no actual lymph nodules. This tissue is found on the posterior and inferior regions of the septum, the

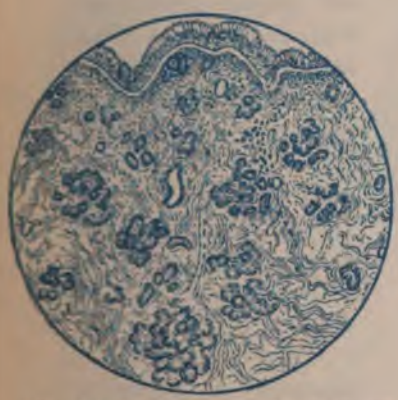


FIG. XLV.—ANTERIOR PORTION OF INFERIOR TURBINAL (½ *in. Obj.*).

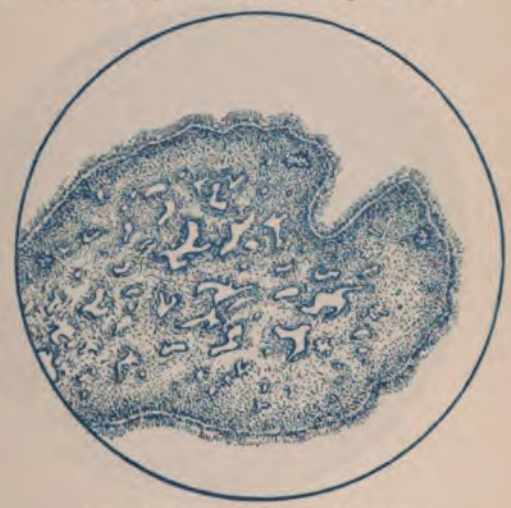


FIG. XLVI.—POSTERIOR PORTION OF INFERIOR TURBINAL (1 *in. Obj.*).

greater part of the superior and middle turbinals, and the middle portion of the inferior turbinal. Embedded in it are numerous compound acino-tubular glands, both mucous and albuminous (serous), the ducts of which are lined by cubical epithelium. Between the acini, stray bundles of visceral muscle-fibres are frequently seen.

The deepest layer consists of periosteum or perichondrium. In either case it is constructed of highly vascular, closely packed bundles of white fibres, whose connective tissue cells undergo transition to either osteoblasts or cartilage cells.

Bundles of medullated mixed with non-medullated nerves can be traced in all directions at different levels.

At the posterior portion of the septum the venous channels

are so accentuated as to constitute a small mass of erectile tissue.

The **Inferior Turbinal Body** presents for examination two distinct regions—an anterior and superior which is perfectly smooth, and a posterior region which has a rough and corrugated appearance extending for some distance along the free inferior border. On section, the anterior are seen to conform to the foregoing structural type, but the glands are much more numerous (Fig. XLV.); whilst the posterior area is composed for the most part of cavernous or erectile tissue with very few glands. This vascular cavernous tissue is the *Schwelkörper* of Zuckerkandl.

Although it will be seen that the corrugations do not always individually correspond with cavernous loops, for many of them consist simply of ordinary retiform tissue and capillaries, nevertheless the great vascular variations of the region may be responsible for those irregularities, thereby affording a much larger area of surface available for the important local changes.

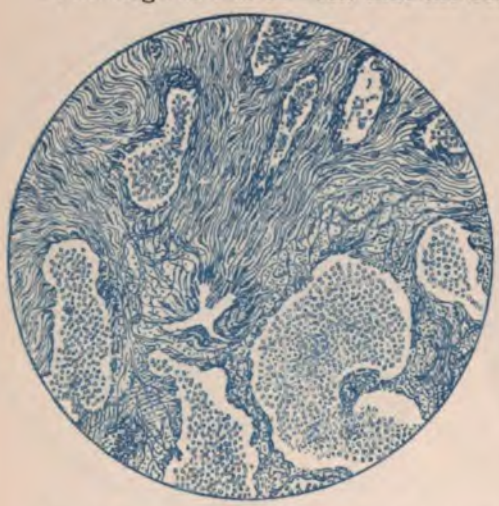


FIG. XLVII.—ERECTILE TISSUE OF INFERIOR TURBINAL (¼ *in. Obj.*).

In detail, this region presents a series of irregular vascular channels more or less filled with blood; which, although occupying the greater part of the section between the surface epithelium and the periosteum, belong for the most part to the deeper layer. Their walls consist of white fibres with fine nucleated connective tissue corpuscles and a few elastic fibres mingled with numerous visceral muscle fibres, which run in all directions and form interlacing bundles between adjacent spaces (Fig. XLVII.). There is no difficulty in demonstrating these muscle fibres in the healthy structure, but in certain morbid states they frequently disappear to a marked degree. There is much doubt as to the exact relation of these spaces with the arterial supply, but careful examination of injected specimens shows that the arterioles do not *directly* communicate with them. The arterioles seem to break up into a fine plexus of thin capillaries close

to and in the hyaloid basement membrane, from which venules collect the blood, and, converging, increase in diameter as they pass downwards to open directly into the large cavernous spaces (Fig. XLIV.). This arrangement is readily observed in cases of marked hypertrophy.

Much scepticism has been exhibited as to the existence of visceral muscular fibres, but this can only have arisen from either a restricted research or the accidental selection of diseased structures for microscopical examination.

3. **Olfactory Region.** — This area, as its name implies, corresponds with the distribution of the terminals of the first cranial nerve, and includes the upper third of the septum, the superior turbinal, and part of the olfactory groove. Some authorities also include the upper portion of the middle turbinal. It is interesting to note that the extent gradually diminishes with the advance of years, for in the embryo it is relatively larger than in the adult. The region is generally described as having a yellow tint in comparison with the other areas. This, however, is more appreciable post-mortem.

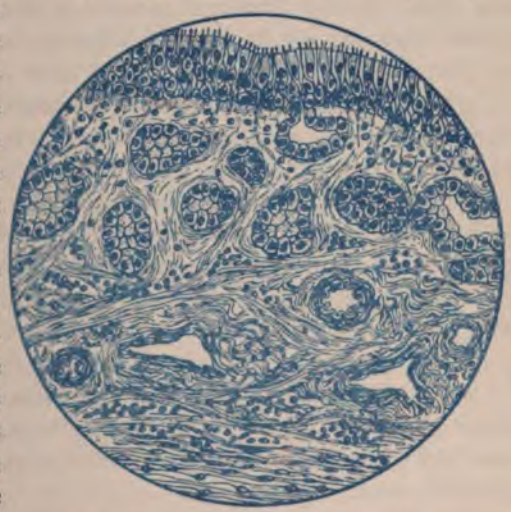


FIG. XLVIII.—OLFACTORY MUCOUS MEMBRANE (¼ *in. Obj.*).

Like the skin, the olfactory mucous membrane is subject to great variations both temporary and permanent, but the intensity or absence of pigmentation must not be considered as positive or negative evidence of the olfactory sense, for often the colour may extend beyond the olfactory area, and the pigment may be found in the glands as well as the surface epithelium.

The surface cells of the olfactory region are of three kinds:—

1. The Cylinder cells, somewhat columnar in shape, and possessing *ovoid* nuclei which together form a well-defined single zone superficial to the round nuclei. The free end of the cell is generally flat, devoid of cilia, and, according to Von Brunn, is covered by a fine external limiting membrane, but the central end

is broken into branched processes, which are lost amongst the other cells. The protoplasm contains a variable amount of pigment granules. These bodies are apparently transformed into the ciliated variety in the respiratory area.

2. The Rod or Olfactory cells of Schultze are considered to be the actual or special terminals of the olfactory nerve fibres. They are long, narrow, spindle-shaped bodies, each containing a *spherical* nucleus and bearing two processes. They are more numerous than the cylinder cells, and their nuclei, two or three deep, constitute the deeper zone. The superficial process is very thin, and projects as far as the level of the free surface in the fresh state, or a little beyond, as often occurs after hardening and staining. The central or deep process is slender, often beaded, and is lost amongst the basal cells, where it forms a connection with the fibres of the olfactory nerve. These cells are not pigmented.

3. The Basal cells consist of branched, irregularly-shaped bodies with oval nuclei which help to form the closely packed inner nuclear zone. They are probably 'supporting' cells.

It will thus be seen that the cells conform to the usual typical arrangement of special sensory terminals, viz. a set of special cells connected with nerve fibres and a set of supporting cells bearing pigment. In fishes the resemblance to taste buds is shown by an arrangement of the olfactory cells in well-defined groups.

Beneath the epithelium is a very thin layer of fine connective tissue and capillaries constituting a basement membrane, but it does not present the hyaline features so well marked in the non-olfactory area.

Farther inwards a deep zone of gland substance appears. This consists of somewhat simple acino-tubular glands, separated by bundles of non-medullated nerves. They are generally known as Bowman's gland, and belong to the serous or albuminous variety. Their ducts, which are lined with cubical epithelium, open either directly between the surface cells or into small ciliated ampullæ below the epithelium. The secretory cells are granular, often contain pigment, and, failing to fill the acinus, leave a comparatively large lumen.

Thus the olfactory area is relatively more richly glandular than the respiratory, and the glands are solely of the serous variety.

More deeply the section presents a loose arrangement of connective tissue fibres, with arteries and veins, but no indications of erectile tissue. Medullated nerve fibres are also seen, but these belong to the fifth nerve.

CHAPTER IV

INSPECTION OF THE LARYNX—THE LARYNGOSCOPE

IT is difficult by a mere verbal description to explain clearly any process requiring technical apparatus and skill, and one practical lesson is of more value than a dozen pages of written directions.

My purpose being, however, to make laryngoscopy intelligible to those who are unable to avail themselves of personal instruction, this will probably be best effected by enumerating and describing, somewhat dogmatically, the steps to be taken in making a laryngoscopic examination. The most probable causes of failure will then be pointed out, with directions how to avoid those which depend on the observer, and to overcome those which are due to obstacles pertaining to the patient; pursuing thus precisely the same course as if personally instructing a pupil at hospital.

It is impossible to overestimate the value of good illumination in assisting to obtain a clear and useful view of the larynx. For this reason the question of the relative merits of the different sources of light will be gone into as thoroughly as possible. In the treacherous climate of England, and especially of London, it is almost essential to have recourse to artificial illumination, sunlight being so rarely available. Of the various forms of artificial light, that afforded by gas is, for constant use, on all accounts the best, and no lamp can be more complete than the universal rack-movement apparatus. For many years all my work was done by aid of a lamp (Fig. XLIX.), the light of which is in every respect similar to that of the rack-movement lamp, but the apparatus of which is constructed on the principle of the 'Queen's reading-lamps.' This form of lamp is not only much less expensive than the rack-movement, but it can be attached to an ordinary gas-burner by an elastic tube, and can be adapted for ophthalmoscopic examination or used as an ordinary study lamp. The illuminating power of an Argand burner in such a lamp is given as that of ten candles, but this is much diminished by the lens

and the reflector. The 'Incandescent mantle' gives a superb light, and is even preferred by some to whom the electric current is available. It can be employed with this lamp. The new Acetaline lamp promises to surpass the incandescent.

Where gas cannot be obtained, any other kind of lamp, such as a Moderator, Queen's, Paraffin, or Duplex, which gives a bright, steady light, will answer the purpose; and a practised laryngoscopist may obtain a good image even with a candle in a bull's-eye lantern, or with a carriage lamp. Several useful portable lamps are sold by the instrument makers. The pocket-condenser of Sir George Johnson is invaluable for country practitioners; but in the absence of a condensing lens a piece of white paper placed behind a lamp or candle will add considerably to the brilliancy of the light.

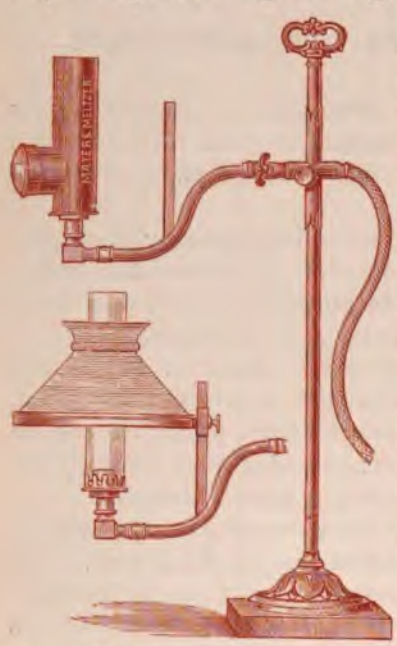


FIG. XLIX.—A CONVENIENT STANDARD GAS LAMP, WITH ARGAND BURNER, WHICH CAN BE ATTACHED TO ANY GAS JET, AND CAN BE USED FOR VARIOUS PURPOSES.

Shortly after the first edition of this work appeared in 1878, I succeeded, after many trials, in perfecting a limelight, now known by my name, although I made no particular claim to originality. The illuminating power is not only all that can be desired, but it is at the same time economical, and easy of manipulation.

The following is a (modified) description of the apparatus, which appeared in the *Specialist* of September 1st, 1880, and to it nothing need be added, except that a daily experience during the many years that have since elapsed has amply confirmed the promise first held out of its superiority over all other methods of oxy-hydrogen illumination:—

The apparatus consists essentially of the following parts:—

1. The source of the light.
2. The rectifying lenses for converting the ray of light into a parallel beam.
3. The absorbment cell, for arresting the calorific rays.
4. The principal chamber for containing the various parts.
5. The igniter and dissolver, for instantaneously producing and extinguishing the light.

The various parts will be well understood by a reference to the illustration.

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two in front of it, in the centre of the beam of light. Under these circumstances the temperature will be seen to be scarcely raised at all; but if the cell be removed, it is speedily increased to an uncomfortable heat.

The Principal Chamber.—This is marked P C, and it consists of a vertical brass cylinder, having on one side a tube carrying the rectifying lenses, and at its base a divided socket, by means of which it can be attached to the arm of the ordinary gas standard without in any way interfering with or deranging the same. The lime-light jet is also fixed in this chamber in its right position, and requires no further adjustment. It may not be out of place in this connection to mention that the limes now used are much less fragile and more durable than was formerly the case. A lime supplied with this apparatus will last for several sittings, provided it be removed after use and kept dry in a metal box. A simpler plan is to allow the small pilot-flame to remain burning, which prevents the lime becoming damp, and preserves a cylinder for a long time.

The Igniter and Dissolver.—This, consisting of the main tap, is the only part remaining to be described. It is marked in the illustration (M T). The igniter is a specially contrived four-way tap through which the gases (H and O) flow in order to supply the jet. This tap is provided with a lever handle, which moves through a regulated arc, so that by one movement the gases are turned on or off at pleasure.

When it is required that the light should be produced, it is only needed that the lever (M T) be moved, and the full light is instantaneously obtained. The igniter is connected with the jet by means of flexible tubes, so that the igniter can be fixed to the top of the operating table, and the jet can be raised or lowered at pleasure, so as to provide for all required conditions.

Directions for Use.—See that all the parts of the apparatus are clean and free from dust, and refill the absorbment cell with water. Put a lime cylinder on to the lime holder, and see that the face of the cylinder comes all but close to the sloping jet. Turn off the taps at the back of the jet, and turn the lever of the igniter to the word 'open.' When gas from a bag is used, see that the proper weights are on the bag containing the oxygen gas (about two half-cwts.), and open the tap of the same, and also the tap or taps that connect the apparatus with the coal-gas main.

When this has all been done, the apparatus is ready to be lighted. The hydrogen tap at the back of the jet is to be partly opened, the gas ignited, and the flame allowed to play upon the lime for a few minutes so as to heat it gradually. The oxygen tap at the back of the jet should now be gradually opened until the full amount of light is obtained; then a little more hydrogen, and then a little more oxygen may be added, until the desired result is secured. *The taps at the back of the jet will not require any more attention; the igniter performs all else that is needed.*

It will be observed that there is a screw passing through a pillar in the plate of the igniter, against which the end of the lever stops. This screw is required to regulate the length of the arc through which the lever moves, and consequently the size of the permanent hydrogen flame. As this screw is drawn back the tap is more nearly turned off, and the size of the permanent flame is decreased; whereas to the extent that the end of this screw is pushed forward the size of the permanent flame is increased.

When the apparatus is done with, the taps at the back of the jet should be turned off, as also the tap of the bag and the tap connecting the apparatus with the coal-gas main.

Any portion of the apparatus can now be removed and put away.

The advantages of the above combination are, first, that it is exceedingly simple, and, being made to fit on to the ordinary gas standard, does not require any cumbersome arrangement of lantern. If from any cause it should be desirable, the whole thing can be unshipped in two minutes, and the gas-light made immediately available.

It can be used either as a direct light or with the usual frontal or hand reflector. This is a point of considerable importance, since in the first place the direct method of examination—I speak more particularly of throats and ears—is inconvenient to those accustomed to the use of the reflector; in the second, reflected light is infinitely preferable

when it is desired to follow even slight movements of the patient, as is always the case, and especially when performing operations. Needless to say, however, that the lamp is equally available for direct light.

By means of the absorbent cell the amount of heat is rendered less than that of an ordinary Argand burner.

The igniter and dissolver economise the oxygen by a movement most simple and easy to the operator.

The initial cost is small; the expense of those fixed at the Central Throat and Ear Hospital, including all connections, is now under £5.

If care be taken to avoid waste, not more than two cubic feet per hour of oxygen are necessary even with the constant use of hospital practice; in other words, the cost of the light, inclusive of the carburetted hydrogen, is not more than 2d. an hour. It is a little more with condensed oxygen, but the first cost of the bag is avoided.

This limelight was tested some time since by Messrs. Silber, who estimated it as equal to fifty of their lights, or as of 1000 candle-power. Candle-power is a term of very arbitrary character, and one often improperly applied. When a light is focussed on to any one point, the illuminating power is probably but a third or fourth of what would be the whole circle of the flame. I am certainly inclined to think the above estimate too liberal if coal gas be used; and naturally the light will vary considerably, according to the quality and pressure of the gas. But if condensed oxygen be used from a metal cylinder, the light is nearly twice as brilliant as with oxygen used from a bag; and the substitution of pure hydrogen for coal gas is also attended with great increase of illuminating power. In any case, at its lowest figure it far exceeds any ordinary means of illumination, and must commend itself to specialists. It has received the approbation of many American and Continental practitioners who have adopted it in their practice.

It is unfortunate that incandescent electric lamps of the shape used in lighting houses are not fitted for laryngoscopic purposes, as the picture of the carbon filament is always visible, and shadows are produced which make a correct examination impossible. Moreover, since the filament is irregularly distributed over a large area, its rays cannot be brought into focus by a lens.

These difficulties have been to some extent overcome in an excellent focus lamp made by Messrs. Schall. The filament is replaced by a broad carbon ribbon, which is wound to a spiral in the middle of the lamp. In this way the whole of the available light is concentrated into a small space, and the uniform rays thus obtained are further brought into focus by means of a bull's-eye. The lamps can be procured of any candle-power, but those most commonly in use are 32, 50, 100, and 250 candles. Experiments have shown that the light of a 100-candle

lamp is about equal to an ordinary limelight fed with coal-gas and oxygen, while the 250-candle lamp is considerably stronger. In any case, however, the electric light does not focus to a luminous point of such intensity as the limelight.

The lamp itself is constructed very much like that of all those intended for laryngoscopy, being fitted in a bracket movable in all directions. An apparatus, consisting of a glass cell filled with water, absorbs the rays of heat, and one side of this cooling vessel is formed by a second lens, by means of which the rays of light are made to converge on the forehead-mirror.

The incandescent lamps can be easily exchanged, and the apparatus has the advantage of great convenience and illuminating power, and of making its owner independent of the supply of gas. The first cost is about equal to that of a limelight lamp, and the consumption of electricity amounts to 2½d. an hour for a 100-candle lamp.

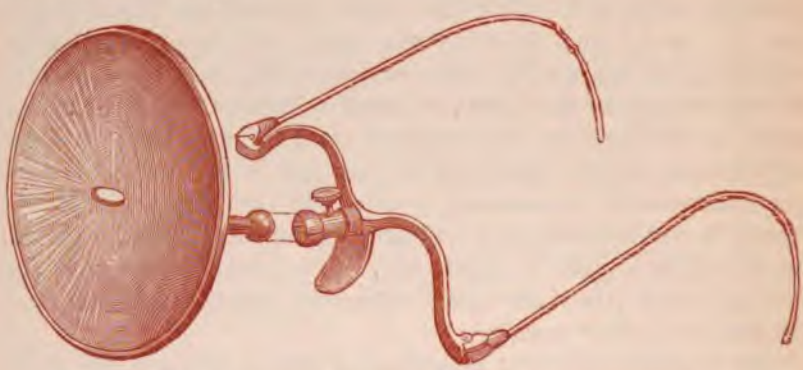


FIG. LI.—LARYNGEAL REFLECTOR (HALF MEASUREMENTS).

Before proceeding to describe the method of using the laryngoscope, a brief account of the instrument itself is necessary.

Strictly speaking, the **Laryngoscope** consists of but one instrument, namely, a small mirror, which, when placed at the back of the mouth, and illumined either by solar or artificial light, reflects the image of the cavity of the larynx, and of more or less of the trachea.

The majority of practitioners examine by the aid of indirect or reflected light, and for this purpose a second mirror is required. Laryngoscopy, then, as usually practised in this country, involves the use of two mirrors—one to concentrate and reflect the illuminating rays on to the fauces, and the other to throw the

light thus reflected into the larynx, the image of which it in turn reproduces.

These mirrors are called the *Reflector* and the *Laryngeal Mirror* respectively. I propose simply to describe the means and method of examination which I am in the habit of practising, without entering into minute details as to the differences in practice, by no means essential, of various laryngoscopists.

The **Reflector** (Fig. LI.) is a circular mirror about three and a half inches in diameter, perforated with a small hole in the centre, and fixed by a ball-and-socket joint to a kind of spectacle frame, the lower rims of which have been removed. This is supported on the bridge of the nose by a plate of tolerably soft metal, which can be adapted to the individual examiner. This instrument, first

FIG. LII.—THE LARYNGEAL MIRROR.

a. The mirror (half measurements).
b, *c*, *d*, represent exact size of the reflecting surface of mirrors of varying dimensions.

devised by Duplay, and known in England under my name, will be found much less fatiguing for long-continued use than that of Semeleder (also called by English makers after Mackenzie), which clips the nose like ordinary spectacles. The removal of the lower instead of the upper rim is also a very real advantage, as the lower rim is always apt to come in the way of the vision. Practitioners who are ametropic can easily have suitable glasses fixed into this frame. The reflector should be slightly concave for use with artificial light, but plane for sunlight examination. The combination of the two in a folding frame, as long used by ophthalmoscopists, can be conveniently carried in the pocket. The usual focal distance is from eight to fourteen inches, and it is important that practitioners should obtain accurate information on this point before buying a reflector, in order that they may adapt it to their

own vision, whether long or short, and may also know at what distance their head should be from the patient so as to obtain a proper disc of light.

The reflecting mirror may be worn either over the forehead or, preferably, over the right eye, the central orifice being utilised for visual purposes; in the latter case both eyes are protected from the glare of the light—the one directly, and the other by the shadow which the reflector casts.

The **Laryngeal Mirror** (Fig. LII.) is circular in shape, made of glass silvered on the back, set in a German-silver frame, and attached at an angle of 120° to a slender shank of the same metal about three and a half inches in length: this shank is further fitted into an ebony or ivory handle, four inches long. Recently these mirrors have been improved by the making of frame and shank in one piece of steel, nickel-plated.

FIG. LIII.—DIAGRAM ILLUSTRATING THE PRINCIPLE OF THE LARYNGOSCOPE.

The mirrors are about one-twelfth of an inch thick, and are made in three sizes, the diameters being half an inch, four-fifths of an inch, and one inch respectively.

The principle on which the art of laryngoscopy is based is simply that of the well-known optical law, that when a ray of light falls on a plane surface, the angle of reflection is equal to the angle of incidence (Fig. LIII.). Thus the light (L), being thrown from the reflector (R) on to the laryngeal mirror (M) placed at the back of the mouth, illuminates the larynx (V); and, on the same principle, the image (V I) of the illuminated larynx is reflected on to the laryngeal mirror, and may there be seen by the eye of the observer (O). It is important to remember that the parts of this reflected image correspond, so far as lateral position is concerned, with the actual relation of the parts of the larynx; that is to say, what is right and left in the larynx of the patient remains right and left in the mirror. It is equally important, of course, to bear in mind that the patient's right corresponds with the observer's left, and *vice versâ* (Fig. LIV.). The only

inversion which takes place is in the antero-posterior direction—the front of the larynx, which is represented in the diagram by the apex of the V, and is nearest to the observer, appearing at the upper, and, so to speak, further part of the mirror, whilst the posterior part of the larynx appears in the lower and nearer portion of the field (Fig. LIV.).

The relative horizontal levels of the different parts are well preserved; the epiglottis is seen to be on a higher plane than the arytenoid cartilages, and the ventricular bands are observed above the vocal cords. So far as observation is concerned, then, the apparent antero-posterior inversion is of no importance, but it must be carefully remembered when introducing a brush or other instrument into the larynx.

With regard to the furnishing of a room for laryngoscopy, very little is required. My own room is arranged as follows:—A small-seated, moderately hard chair, with an upright back, is fixed close against the wall, for the patient; in front of this an ordinary chair or music-stool for the observer. On the left of the patient's chair is a pedestal table, with the examining lamp, a carafe of water, a tumbler, and a glass tray containing an antiseptic solution. The table is constructed with drawers for tongue-cloths and instruments. On it stands also, compressed air receiver for sprays, etc. On the right is a revolving shelf-table for solutions required for ordinary use, and a spittoon. It will be seen, from the simplicity of these arrangements, that laryngoscopic examination may be made in any room. One thing is to be remembered, namely, to place the patient so that the daylight from the window and the reflected light may not be in antagonism.

FIG. LIV.—DIAGRAM OF LARYNGEAL MIRROR ILLUSTRATING THE REVERSION OF THE REFLECTED IMAGE.

To make an examination of the throat and larynx the following steps must be taken in the order named:—

1. Direct the patient to sit erect, with the knees together, and the head slightly thrown back.

2. Arrange the lamp so that it is distant about 9 inches to the left of the patient's head, and in a line with his ear.

3. Sit opposite the patient, and adjust the reflector so that the right eye looks through the central perforation. (By this arrangement *both* the observer's eyes are screened from the glare

of the light, which is not the case when the reflector is worn on the centre of the forehead.)

4. Direct the patient to open the mouth widely.

5. Throw the light on to the point of junction of the uvula with the soft palate, according to the focal distance of the reflector, and examine thoroughly the parts there exposed,

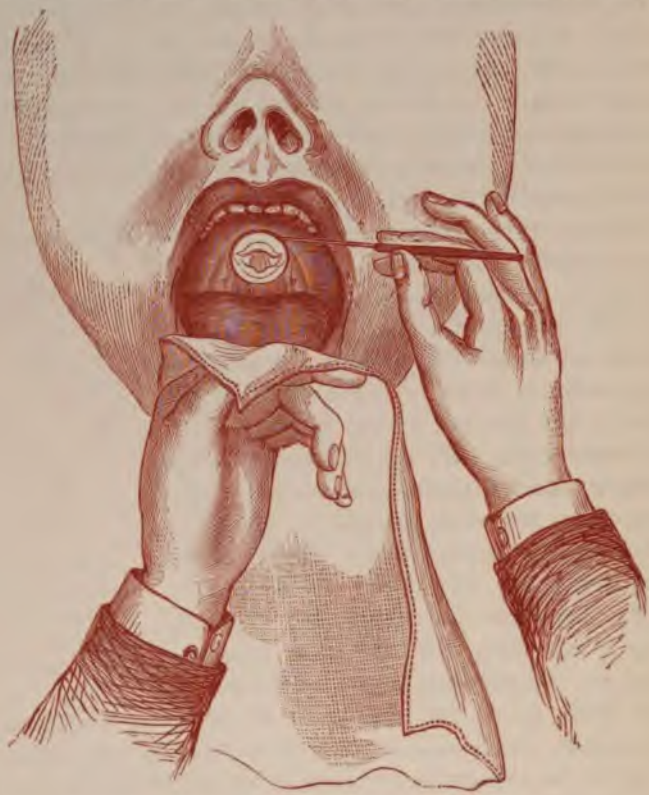


FIG. LV.—POSITION OF OBSERVER'S HANDS IN MAKING A LARYNGOSCOPIC EXAMINATION.

such as the uvula, tonsils, fauces, and back of the pharynx (see Chapter V.).

6. Take the laryngeal mirror in the right hand,[1] and slightly warm it over the lamp, to prevent its being dimmed by the

[1] Of course, all these steps may be taken with the hands reversed; and one advantage of holding the mirror always in the left hand is that, when the right is required for operative measures, the laryngeal mirror can be held in the opposite hand without any sense of awkwardness. In this, however, as in all surgical procedures, the practitioner should be ambidextrous.

moisture of the patient's breath. Test the warmth of the mirror by placing the back of it against your own hand or cheek. It will be noticed, when holding a mirror over a lamp, that the glass becomes covered with a film of moisture, which soon clears away. The moment this moisture has disappeared, and the glass becomes clear, the mirror is at the right temperature.

Alternative suggestions have been made to keep the mirror clear, such as smearing it with soap and lightly wiping; dipping in glycerine or glycerine and water, etc. These may be very useful for the dentist, who generally requires to retain the mirror longer in the mouth than does the laryngoscopist, but they are not likely to supersede the older method by warming, as just described.

7. Direct the patient to protrude the tongue.

8. Gently draw the same forward with the left hand, previously enveloped in a small cloth or napkin, holding the organ between the thumb and index finger (Fig. LV.), the former being uppermost (see below, caution B).

9. Holding the mirror like a pen in the right hand, and, following the curve of the hard palate, introduce it into the patient's mouth with the reflecting surface directed downwards, and then, holding it horizontally, rest its back *gently* against the uvula (Fig. LV.).

10. Turn the hand slightly towards the patient's left, so as to keep out of the line of view.

11. Direct the patient to take a deep inspiration, and then to utter the sounds *ah*, *ur*, *eh*, or *ee*.

A view of the larynx should thus be obtained (Fig. LV.), and the vocal cords, which are easily recognisable by their pearly colour, should be seen separating on inspiration, and approaching on phonation.

There are, however, frequently certain difficulties in the way of making a laryngoscopic examination, and they may be divided into two classes—those due to the observer, and those pertaining to the patient.

The pupil should constantly bear in mind the motto, '*Arte non vi*.' He must not, because at first he sees only the base of the tongue or the upper surface of the epiglottis, at once make up his mind that the patient before him is one of those in whom it is impossible to obtain a view of the larynx. On the contrary, he must examine this same patient carefully each day until he succeeds; for it cannot be too strongly insisted on that the proportion of cases in which a skilled laryngoscopist is unable to obtain a satisfactory picture in the laryngeal mirror is *very small indeed*. Attention to the following cautions may obviate failure:—

A. Be careful that the light is thoroughly well reflected and learn to keep the disc of light *steadily* directed on to the fauces.

B. In holding the tongue, grasp it firmly, but *gently*, and do not draw it down on the teeth, so as to hurt the frænum, or otherwise give pain. If the tongue has any tendency to be elevated at the dorsum, it is worse than useless to pull at it, as the contraction is thereby only increased. In such cases a better view may occasionally be gained by directing the patient to hold his own tongue, or by allowing the tongue to be kept within the mouth. This last alternative should always be adopted by preference in the case of singers, and indeed, whenever it is desired to observe the movements of the cords in the production of tone, since traction on the tongue is apt—though but slightly—to distort these movements.

C. Be very careful, after warming the mirror, to test its temperature on the back of the hand or the cheek, lest it be so hot as to be disagreeable to the patient.

D. Be careful not to touch the tongue with the mirror when introducing it.

E. Press the uvula very gently upwards and backwards, but do not force it against the posterior wall of the pharynx, or retching and gagging will immediately ensue.

F. When the mirror is introduced, adapt the exact angle to the relation which the plane of the larynx bears to the position both of patient and observer, and do not too quickly decide that, because at first only the epiglottis or the posterior commissure is seen, therefore an image of the rest of the larynx is unattainable.

G. Let each examination be very short, especially on the first occasion of seeing a patient. The mirror may then be introduced six or eight times without producing spasm or nausea, whereas, if the mirror be too long retained, irritation of the fauces will frequently be produced, and all efforts at further examination will, for that occasion at least, be unsuccessful. Besides the annoyance this will cause the observer, there is the fear that the patient

may lose confidence and be unwilling to submit to further examination or treatment.

The difficulties on the part of the patient are either mental or physical: of the mental, the chief is the apprehension that the instrument will cause pain; therefore—

H. Take the trouble, especially with children and female patients, to explain that the process is simply a method of *examination*, and that it is in no sense an operation.

I. Wherever apprehension or timidity exists on the part of the patient, it is often well to introduce the mirror gently into the mouth once or twice, and to quickly withdraw it, before any real attempt is made to examine the larynx.

Intolerance of laryngoscopy is rarely due to any physical cause on the part of the patient, but is almost always the result of nervousness. It may, however, be caused by the disease under which the patient labours; for example, a patient suffering from simple congestion or relaxation of the mucous membrane, or from laryngeal phthisis, is more intolerant of anything touching the uvula or posterior wall of the pharynx than is a patient suffering from syphilitic disease or lupus. In chronic granular hypertrophy of the vault of the pharynx, the symptomatic irritation, which produces spasm, retching, and gagging, is liable to be increased, especially if the posterior wall be touched by the mirror. In almost all affections of the motor nerves of the larynx there is some co-existent diminution of sensibility; and few cases present less difficulty in the way of satisfactory laryngoscopic examination than that of a patient suffering from functional aphonia.

Of all artificial methods of reducing intolerance of laryngoscopy, none is better than to cause the patient to suck small pieces of ice for a few minutes, and, should it not be available, sipping cold water or gargling with the same by the Von Troeltsch method, as described at page 142, in Chapter IX., will frequently have a similarly satisfactory effect. In more extreme cases, especially where intolerance is due to pathological causes, the painting or spraying the soft palate with a 5 or 10 per cent. solution of hydrochlorate or cocaine or of eucaine will render easy an examination which might otherwise have been difficult or impossible. It is better on every account to repeat application of a weak solution than to employ a stronger one, as often recommended. As to instruments of the nature of the 'throat educator,' which the patient is frequently to introduce into his throat, so as to diminish its

sensitiveness to instruments, I am bound to say that I have never yet met with cases in which such a measure was necessary. The gentle hand and encouraging word will, in my experience, do more than any other training. All mechanical appliances for holding the uvula or for fixing the patient, invariably act as hindrances rather than as aids to the observer.

The difficulties due to the conformation of the larynx itself, and the best methods of overcoming them, will be treated in the description of the laryngoscopic image in Chapter IV.

It often happens that a view of the posterior, or œsophageal, aspect of the larynx, and especially of its subglottic portion, is not easily obtainable. In these circumstances the method described by Dr. Killian, of Fribourg, may be adopted. The patient should either sit in a high chair, or stand, and, holding the head well forward, should flex the chin down on to the chest; he should further be directed to control his own tongue with the cloth. The observer should either kneel or 'squat,' and, looking upwards, should pass the mirror as far backwards as possible. By pursuing these manœuvres--modifying the details according to the varying conditions—a satisfactory image of the posterior laryngeal wall can often be obtained.

A few words remain to be said concerning **Laryngoscopy in Children**. I entirely agree with Schroetter, Lefferts, and others, that those physicians are mistaken who declare it to be impossible or exceptional to make a satisfactory laryngoscopic examination —or even a posterior rhinoscopic—in the case of children; and I as emphatically dissent from the opinion of those who consider force necessary. On the contrary, such a course only leads to resistance and failure of consent to a second attempt. In my own practice I take every step exactly as with an adult, only differing in perhaps saying less rather than more to the patient beforehand; for, telling a child that he is *not* going to be hurt is often the first suggestion that he *may* be. As to position, the child, if under seven, should be examined sitting on the lap of the mother or nurse, who is to be directed to hold herself upright and support the child against her chest with her hands, one on each side of the head, and to keep its legs steady by fixing them between her own knees. If over seven years of age, I make the child stand up instead of sit, unless a chair higher than that ordinarily used for adults is available.

The chief difficulties in the way of infantile laryngoscopy are: first, the possibility that the child will not open the mouth; secondly, that he will not protrude the tongue; and, thirdly, that

the epiglottis being more frequently, and to a greater degree, pendant in children than in adults, a view even in otherwise favourable circumstances will be unattainable or very partial. The first hindrance will, in the majority of cases, be overcome with a little patience; but should the refusal be obstinate, compression of the nostrils for a second or two will soon cause the little patient to open his mouth, from the necessity to take breath. As to the second, it is by no means absolutely necessary that the tongue should be protruded; and the third obstacle, the others having been overcome, is often removed if the surgeon is on the alert to take advantage of reflex 'gagging,' which act he may even usefully stimulate by a little extra pressure of the laryngeal mirror against the fauces.

To prove that laryngoscopic procedure in children is by no means impossible, it may be noted that the figure on PLATE VII., representing laryngeal diphtheria in a child aged four, was drawn from nature, and I have operated repeatedly for laryngeal growths in children not older than six or seven years of age. Schroetter mentions that he has seen inside the larynx of a child six months old, and I think I may say that I have often succeeded in obtaining, if not a complete view, at least useful indications towards establishing or confirming a diagnosis in children quite as young.

FIG. LVI.—KIRSTEIN'S SPATULA FOR DIRECT LARYNGOSCOPY.

Moreover, it is not at all impracticable to get a view of the larynx of the infant under influence of an anæsthetic, which may be either partial or complete.

In such a case it is of course advisable to enforce the usual precautions of fasting from food, so as to avoid vomiting. For the purpose of examination the little patient should be held by the nurse in the ordinary laryngoscopic position. A mouth-dilator or prop is essential.

Finally, it may be mentioned that in the rare cases in which the obstacles to laryngoscopic examination of a child are insuperable, a view may often be obtained of the interior of the larynx, on account of its higher position in the throat in children, by rather forcible depression of the base of the tongue with a

spatula. This suggestion, offered in my second edition ten years ago, has recently been dignified as an invention by Kirstein, who, claiming that the method can be applied to patients of all ages, calls his spatula 'the autoscope.' This, however, it is not. It is simply a *direct* method of examination of the larynx itself, as distinguished from the *indirect* method in which an image of the larynx is seen in a mirror.

Useful as this direct inspection may occasionally be to the expert laryngoscopist, it can never be other than an imperfect guide to knowledge in the hands of those unskilled in the art. The above illustration of Kirstein's spatula (Fig. LVI.) is sufficient to demonstrate the limited scope of its possibilities.

CHAPTER V

INSPECTION OF THE MOUTH, FAUCES, AND ORO-PHARYNX.

A THOROUGH inspection of the parts visible to the unaided eye is an indispensable preliminary to use of the laryngeal mirror; first, in order that the observer may not be searching for a cause of disease in the larynx which is in truth much nearer at hand; and, secondly, because the condition of the fauces and other supra-glottic structures, as seen through the open mouth, will often afford valuable indications of what may be expected on employment of the laryngoscope or rhinoscope.

Prior, therefore, to consideration in detail of the parts comprehended in the laryngoscopic image, it will be useful to briefly pass in contemplation the various structures brought to view when the light from our reflector is thrown into the patient's open mouth. In my own practice I always attempt, in the first instance, to see the throat without employment of a spatula or tongue depressor; but, as a matter of fact, very few patients—only such as have undergone proper training, as singers—can keep their tongues under control, and on this account some form of instrument is almost always necessary. A paper-knife or spoon handle, always ready to hand, will frequently answer every requirement; but for the consulting-room a special depressor is indispensable. My own experience leads me to say that the best form of instrument is that of Fränkel, the blade of which is not so broad as to cause reflex elevation of the dorsum of the tongue, while the end being fenestrated may often be utilised for lifting up the uvula. The handle is, moreover, so arranged as to keep the hand holding it away from the line of vision. This instrument as used by me is slightly different from that usually sold by the makers, inasmuch as its under surface is roughened. When placed in position it may be entrusted to the patient, a valuable proviso, because pressure upon the base of the tongue (necessary in posterior rhinoscopy) is less apt to produce retching when its amount is controlled by the patient himself.

On the first examination of a patient, and especially when made by a surgeon not accustomed to the process, gagging and retching will often occur, the tongue resisting all attempts to control it. It is worthy of note that pressure on that portion of the tongue anterior to the *sulcus terminalis*—that is to say, that portion supplied by the fifth nerve—is remarkably tolerant of such manipulation, whilst very moderate pressure behind that line, in the region supplied by the glosso-pharyngeal nerve, is immediately resisted. The last-mentioned result may often be turned to account, as first advised by Voltolini, when it is desired to bring more of the back of the throat into view than would

FIG. LVII.—FRÄNKEL'S TONGUE DEPRESSOR, AS USED BY AUTHOR (NEARLY HALF MEASUREMENTS).

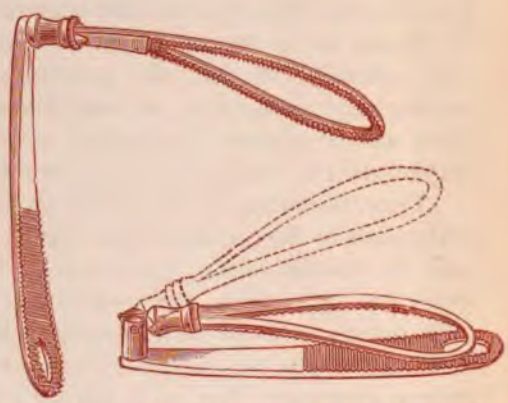


FIG. LVIII.—HILL'S FOLDING TONGUE DEPRESSOR AND RETRACTOR (HALF MEASUREMENTS).

otherwise be effected, especially, for instance, in cases of disease of the tonsils, pillars of the fauces, or base of the tongue; but in order to avoid such reflex movements, certain hints may be acceptable: 1, not to place the depressor too far back on the tongue; 2, not to exert too great pressure thereon; and 3, to depress in the middle line, and preferably with a narrow instrument. Observance of these hints will go far to prevent reflex contraction and arching of the tongue, which is the first and commonest hindrance to a throat examination. Fränkel's depressor, made entirely of metal, is the one at present used by me. Hill's instrument is convenient, as it may be folded and is thus easily carried; in addition to the merits of Fränkel's instrument, it possesses a powerful retractor, which is very serviceable in examination of the base of the tongue.

Baber's suggestion of a thimble tongue depressor has certain advantages, and its utility in an extended degree has long been recognised in my practice, not only for general throat examinations, but as especially serviceable for children, in whom two special difficulties in the way of satisfactory inspection are to be mentioned. In the first place, there is often refusal to open the mouth at all; and, secondly, when it is open it is often closed on the spatula as soon as introduced, or on the surgeon's finger, if imprudently placed there. These difficulties are overcome by the surgeon compressing the nostrils of the little patient with the left hand. In a couple of seconds the mouth is of necessity opened for breath, and a spatula, or the finger protected by a guard, should then be deftly introduced. Directly the patient opens the mouth the surgeon will find himself further protected against being bitten, if he, with his left hand, presses the patient's left cheek between the upper and lower teeth. Lately I have abjured the metal guard I formerly employed, first for a leather one, and later still for an even simpler one (Fig. LIX.), which consists of a piece of thick india-rubber tubing covering the proximal phalanx of the index finger. For examination of the post-nasal space, as well as for operations under anæsthesia, Wingrave's mouth-prop (Fig. LX.) is indispensable; nor has it been improved by several so-called modifications.

FIG. LIX.—SOFT RUBBER FINGER-CARD.

The shield is made to cover the finger entirely between the knuckle (A) and first phalangeal articulation (B), and to project beyond each of these points on the dorsal surface, but the tube is split at each side as shown at C, so as to allow free flexion of the finger at the angle.

The normal colour and appearances of the interior of the buccal cavity are sufficiently familiar even to non-medical persons to make detailed description unnecessary; and in reviewing the different parts of this region I shall content myself with giving brief indications of what we may learn by simple inspection, towards a diagnosis of disease. After the first general glance, which should satisfy the observer as to hyperæmia or anæmia, enlargement, inflammation, or ulceration, adventitious deposits,

malformations, or new growths on tonsils, uvula, and other parts, pathological secretion may be studied in detail.

2. The Teeth should be observed principally (*a*) for indications of the inherited diathesis of struma, syphilis, and the like; (*b*) as possible sources of irritation in inflammatory conditions of the throat, and ulcers in the mouth or on the tongue; (*c*) for unsightliness or deficiency in number, in cases of dysphagia, which may be possibly accounted for by imperfect mastication, "balling" of the bolus, and consequent fatigue and paresis of the pharyngeal constrictors. Artificial teeth, when present, should be inspected for the purpose of ascertaining whether in

THE LARGER ONE

The upper jaw-piece, by movement upwards when the mouth is opened, and the lower jaw-piece, by depression, so that no pressure of the jaw can injure the speculum, prevent the closure. The teeth-sockets are mounted on springs, so that the upper may be raised, without dislodgment, to one side or the other

the use of tobacco the upper and lower teeth so as to effect their separation, and they should always be removed and search be made for any lesions that pressure may have engendered; they should also be removed before attempting any laryngoscopic procedure, since they may not only hinder the necessary full opening of the mouth, but may otherwise complicate the situation. Since chronic nasal discharge may arise from abscess of the antrum, one should also be made of absence of teeth or of the presence of decayed stumps likely to have been the origin of suppuration in this region.

3. The Gums should be well examined (*a*) for indications of scurvy, lead, or other mineral poisoning; (*b*) for various

inflammations, fungi, and new growths; (*c*) for manifestations of idiopathic, syphilitic, tuberculous, or lupous ulcers; and (*d*) as an indication of the condition of health of the blood-supply (anæmia, scurvy, etc.).

3. The **Tongue** requires careful examination on account of both the local and general significance of its appearances. It presents many slight differences in size, surface, and firmness of texture, which are not really departures from the normal; but as there are many diseased conditions of this organ which come under the notice of the throat specialist, its varying appearances should be thoroughly studied and mastered, so that judgment can be formed as to (*a*) 'tone' indications of the general constitutional state, notably those of colour and secretion; (*b*) presence or extension of more or less local manifestations, ranula, syphilis, cancer, tubercle, lupus, lepra, etc., as evidenced by asymmetry, cicatrices, or by impaired mobility due to various neuroses; and (*c*) a possible cause of reflex throat symptoms, of which enlargement of the lymphoid tissue, or lingual tonsil, and varix of the base may be named. For exploration of these last the mirror is generally necessary, and this should be placed rather further forward in the mouth than for ordinary laryngeal inspection; sometimes, however, the whole tongue, and even the lingual surface of the epiglottis, can be seen without any such adventitious aid, and especially if, as previously stated, the spatula is placed so far back as to stimulate retching.

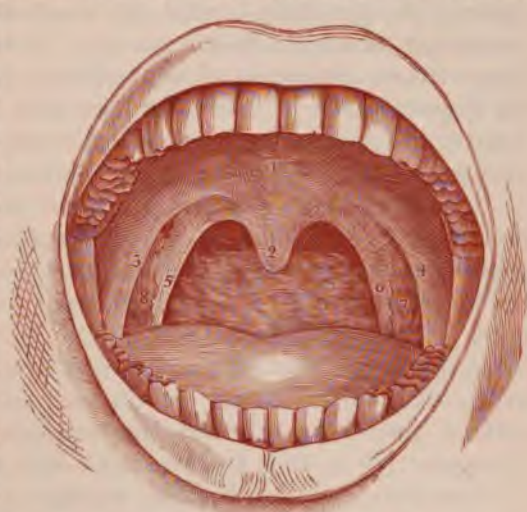


FIG. LXI.—THE ORAL CAVITY.

1. Soft palate.
2. Uvula.
3 and 4. Anterior pillars of fauces.
5 and 6. Posterior pillars of fauces.
7 and 8. The tonsils.

4. The **Buccal Lining** of the oral cavity is the last part to be explored before coming to the throat proper. Normally, it is of a warm pink colour, as of boiled salmon; but its hue varies, being paler over the hard palate, where it is more firmly attached

than at the sides, the lips and soft palate. Independently of the various inflammations comprehended under the term stomatitis, this region is to be viewed for congenital defects as well as for syphilitic, diphtherial, tuberculous, lupous, and other manifestations. In the cases of certain skin affections, as eczema, herpes, etc., there are often more or less analogous conditions of the buccal mucous membrane.

5. The **Soft Palate and Fauces** (Fig. LXI.) hardly require detailed description. Their colour is generally that of the rest of the buccal mucous membrane, but is of deeper hue at the pillars (Fig. LXI. 3, 4, and 5, 6). Impairment of its muscular tone (paresis) is generally tested by observation of the extent of movement of its pendulous portion. I am accustomed to associate marked congestion of the anterior pillars with disorders of the digestive tract or with some dyscrasia, while a similar manifestation in the posterior pillars generally indicates some vocal disorder associated with improper production or over use.

6. The **Uvula** (Fig. LXI. 2), the anatomy of which has been already described, is a very important structure, and its appearance varies greatly according to the method employed in its inspection. When a patient opens his mouth he generally takes a deep inspiration, which has the effect of drawing the uvula upwards. For the purpose of a proper examination of the uvula, the patient should be directed (*a*) to open the mouth without inspiring—this will give an idea of its usual position in repose; (*b*) to sing up the scale—this will indicate its power of contraction; (*c*) to breathe through the nostrils with open mouth—this will show it in its state of greatest laxity. By these steps, and by observation of the relative size and length of the uvula to the arch of the soft palate, data will be provided for forming a judgment as to the part played by this member in a case of throat disease. Passing further remark regarding the pillars of the fauces, the anatomy of which, as of the rest of the soft palate, has already been considered, we must note—

7. The **Tonsils** (Fig. LXI. 7 and 8), which, as previously stated, lie one on each side between the anterior and posterior faucial pillars. The normal range of their size and form varies greatly, but generally it may be stated that in health they should not protrude beyond the plane of the anterior pillars. Nor is their size the only thing to be observed, as when atrophied they may often be diseased. Needless to add also that local evidences of specific dyscrasiæ are often to be seen on the tonsils; these glands call, therefore, for careful inspection.

8. The part of the **Pharynx** that can be seen without either the laryngeal or posterior rhinoscopic mirror is the middle or oro-pharyngeal portion. The mucous membrane covering the posterior lateral walls is normally redder than the mucous membrane of the mouth, and is generally smooth, moist, and lustrous, but may be slightly uneven or wavy in surface within the range of health. Veins of varying distinctness and prominence are also to be seen coursing over it. Cohen says: 'The pharynx often appears deeper on one side (usually the right) than the other, owing to a similar conformation of the anterior bodies of the vertebræ. When the constrictor muscles of the pharynx contract, as they often do involuntarily during inspection, they draw the posterior palatine folds, into which they have insertion, towards each other, so that they nearly or even actually meet, shutting the mouth off from the pharynx. The sensitiveness of the parts, and the amount of mucus and saliva present, vary greatly within normal limits.' This part offers important indications of disease, which may extend either upwards to the nasal, or downwards to the laryngeal portion. It must therefore be thoroughly studied in regard to its colour, surface, secretion, etc.

CHAPTER VI

THE LARYNGOSCOPIC IMAGE

(*Open out* PLATE I. *at end of Book during perusal of this Chapter*)

WE have seen that the laryngoscope reveals to us an image of the interior of the larynx, and we have divided the organ, for practical purposes, into three compartments—the first, or supra-glottic; the second, or glottic; and the third, or infra-glottic, taken in order respectively from above downwards. In looking at the reflection in the laryngeal mirror of a typically healthy larynx (PLATE I., Fig. 1, at the end of this volume), all the three divisions may, on deep inspiration, be seen; but, in not a few instances, the beginner will see only the epiglottis, and perhaps the arytenoid cartilages. This may arise either from the fault of the observer, who has not sufficiently followed the directions or recognised the cautions given in the first Chapter, or from the fact that the epiglottis is really so situated as to obstruct the view.

The accompanying woodcuts (Figs. LXIII. and LXV.) show the two extremes of the views which will be obtained, according to the angle of the mirror with the perpendicular plane of the larynx, and also to the horizontal level at which the mirror is placed in the throat, as shown in Figs. LXII. and LXIV.

Before entering minutely into the appearance presented by each structure when reflected in the mirror, PLATE I. should be carefully studied, especially the two first figures, in order that the reader may become perfectly familiar with what should be observed in the living subject. The laryngeal image will be seen to be circular in shape (though this, of course, would vary with the shape of the mirror employed), and to be bounded by well-defined walls, as would be expected at the opening of a tunnel like the larynx. The epiglottis will be seen to be attached to the base of the tongue, forming the anterior arch of the tunnel,

and occupying the foremost and uppermost position in the plane of the larynx. From each side the folds connecting this valve with the arytenoid cartilages complete the circle, and in the folds may be seen the prominences of the arytenoid and their supplementary cartilages. On a lower plane are the two ventricular bands, reduplications of the mucous membrane of the larynx, containing at their free edge the thyro-arytenoid ligaments. These form the floor of the first or supra-glottic division of the larynx. At first sight the ventricle on each side shows only as a dark line between the ventricular band forming its superior, and the

FIGS. LXII. AND LXIII.—SECTIONAL VIEW, SHOWING THE POSITION OF THE HEAD OF THE PATIENT, AND OF THE LARYNGEAL MIRROR, WHICH WILL GIVE THE MINIMUM AMOUNT OF VIEW. THE LARYNGOSCOPIC IMAGE IN SUCH A CASE IS REPRESENTED IN THE SMALLER FIGURE AT THE SIDE, LXIII.

vocal cords forming its inferior, boundary; but on turning the mirror so as to get a lateral view of one or other side of the larynx (Fig. LXVI., p. 101), the open space of the ventricle will be seen to be much larger than it appears when looking directly down the centre of the larynx, as is done with the usual position of the mirror. It will be further seen that this space varies in shape and size in different movements of the vocal ligaments.

Below the plane of the ventricles are seen, standing out in bold relief, the superior surfaces of the vocal cords, which glisten

like mother-of-pearl, and move towards and away from the middle line with phonation and respiration respectively. Beneath the vocal cords some portion of the third or infra-glottic region can be observed. A portion of the cricoid cartilage will be noted, then some rings of the trachea, and further on, in rare and favourable cases, the bifurcation of the trachea, the right bronchus being the larger and the more visible. Outside the larynx are seen the hyoid fossæ and the anterior border of the pharynx as far as the commencement of the œsophagus.

Let us now examine more minutely, by means of PLATE I. (which should be opened so as to lie beside these pages during

FIGS. LXIV. AND LXV.—SECTIONAL VIEW, SHOWING THE POSITION OF THE HEAD OF THE PATIENT AND OF THE LARYNGEAL MIRROR WHICH WILL GIVE A FULL AMOUNT OF VIEW. THE LARYNGOSCOPIC IMAGE IN SUCH A CASE IS REPRESENTED IN THE SMALLER FIGURE AT THE SIDE, LXV.

perusal of the chapter), each of the structures thus seen in a general view of the larynx. All the numerals in the following description refer to this plate. And once again the reader is reminded that in this illustration no attempt has been made to reproduce the exact colour of the mucous membrane, since its hue differs considerably in different individuals, just as does

the complexion of the skin, and also because the apparent tint varies somewhat according to the kind of light employed.

The **Epiglottis** is in all cases the first object of which a reflection is seen in the laryngeal mirror. It appears as a leaf-like piece of fibro-cartilage connected with the tongue by three glosso-epiglottic folds, namely, two lateral (L G E F, Fig. 1), and one superior (S G E F, Fig. 7). Attaching it to the deep surface of the thyroid cartilage, just above the anterior commissure of the vocal cords (A C, Fig. 1), is seen the thyro-epiglottic fold (T E F, Fig. 2), to the pharynx the two pharyngo-epiglottic folds (P E F, Fig. 1), and to the arytenoid cartilages the two ary-epiglottic folds (A E F, Fig. 1). In some instances the sulci (anatomically termed valleculæ) are seen in the mirror on the lingual surface of the epiglottis. They are situated on each side of the median line, close to the base of the tongue, and are bounded by the superior and lateral glosso-epiglottic folds (Figs. 4, 7, and 11). These sulci are surgically important as being not uncommonly the seat of origin of specific — syphilitic, tuberculous, and lupous — manifestations, as also of malignant formations.

FIG. LXVI.—A SIDE VIEW OF THE LARYNX, SHOWING THE RIGHT VENTRICLE OF MORGAGNI OPEN.

l. Left vocal cord.

The amount of the epiglottis visible in the mirror will depend greatly on the length and degree of tension of its various ligaments; though, as has been said, it will also vary according to the position of the mirror. For example, there may be seen at one and the same time portions of the superior surface (S S E, Fig. 1), of the inferior surface (I S E), of the cushion (C E), and of the free edge or lip (L E, Fig. 2). The epiglottis may vary greatly in shape: it may be of the ordinary curve, and show a portion of both the lingual and laryngeal surfaces, as in Figs. 1, 2, and 11; it may be so pendant as to show but little or nothing of its inferior surface, as in Figs. 5, 7, 8, and 9; it may be angular, as in Fig. 3; folded on itself, as in Fig. 4; with lip but slightly everted and doubly curved, as in Figs. 5 and 11; with serrated or obtusely crenated edge, as in Fig. 6; or asymmetrical, as in Fig. 9; lastly, it may show none of its lingual surface at all, but stand quite erect, as in Fig. 10.

The epiglottis may be looked upon as the distinctive feature of the larynx, for no part is so variable in shape and size, and it

thus largely controls the individuality of the organ. This is not surprising, because, as has been aptly said, there is no more reason why the epiglottis should be uniform than that all noses should be alike.

Although it is true that the epiglottis may vary considerably in shape and size, and yet not materially interfere with the view, as is seen in Figs. 1, 2, 3, 6, 8, 10, and 11; yet, in by far the majority of cases, the configuration of the epiglottis regulates the amount of the larynx visible in the mirror. In Fig. 4, for example, its peculiar form prevents the posterior parts of the cords from being seen; in Fig. 5 little more, and in Fig. 7 no more, of the larynx is visible than the arytenoid cartilages. Occasionally the glandular tissue at the root of the tongue (lingual tonsil) may be so enlarged, and the glosso-epiglottic folds so lax, as almost entirely to hide the epiglottis (Fig. 8); and this appearance may easily be mistaken for disease of the valve itself.

In **colour** the epiglottis may be likened to the inner surface of the eyelids. It is of a warm pinkish yellow, and not infrequently capillary vessels may be seen ramifying over its surface (Figs. 5 and 6). The under surface is always of a deeper colour than the upper, the cushion itself being of a bright red.

During respiration the epiglottis remains erect; and although it moves with variations of vocal notes, it plays no direct part in the production of vocal sound. It has been, and still is, generally assumed that the special office of the epiglottis is to close tightly over the larynx during the passage of food into the pharynx. However that may be, any affection, with the exception perhaps of lupus and leprosy, which interferes with its movements will unavoidably cause discomfort during deglutition.

Above and anterior to the epiglottis is seen more or less of the base of the tongue, with the folds of mucous membrane connecting the two, to which reference has already been made.

Continuing the circle of the laryngoscopic image, there will be seen from each side, and from the under surface of the lips of the epiglottis, the folds of mucous membrane connecting it with the arytenoid cartilages—the **aryteno-epiglottidean**, or, more shortly, the **ary-epiglottic** folds (A E F, Fig. 1). As a rule, only the superior aspect and a portion of the outer or pharyngeal border of these folds are visible. In each fold may generally be observed two rounded prominences, that further from the median line being the **cartilage of Wrisberg** (C W, Fig. 1), and that nearer to it the **capitulum of Santorini** (C S, Fig. 1).

The capitula of Santorini are occasionally seen to override

each other, as in Fig. 10. In many cases the cartilage of Wrisberg is not seen, while in some instances a third small prominence—that of the sesamoid cartilage of Luschka—is visible between those of Wrisberg and of Santorini (Fig. 8).

Connecting the two arytenoid cartilages is the **inter-arytenoid fold** (I A F, Fig. 1), forming the posterior commissure of the vocal cords (P C, Fig 2), and completing the circle of the framework of the larynx.

The **Ventricular Bands,** formerly called false vocal cords (V B, Fig. 1), are reduplications of the mucous membrane continuous with the ary-epiglottic folds, to which they are attached as well as to the under surface of the epiglottis itself. After passing inwards towards the median line, the mucous membrane of each band is reflected, to form the lining of the **ventricle of Morgagni** (V M, Figs. 1 and 6), whence it again issues to cover the vocal cord, and then descend into the trachea. The free edge of the ventricular band is somewhat curved in shape, and encloses a thin ligament (thyro-artenoid), running from the inner surface of the angle of the thyroid cartilage, just below the insertion of the epiglottis, to the anterior surface of the arytenoid cartilage. Occasionally the ventricular bands are over-developed, and they then approach so near to the median line in phonation as partially or completely to hide the vocal cords, as in Fig. 11; but in such a case, with the act of inspiration the vocal cords come into view, and so convince the observer that the appearance, though unusual, is not necessarily pathological.

The **colour** of the ary-epiglottic folds, as well as of the ventricular bands, is that of the mucous membrane lining the cheeks, while the portion covering the cartilages of the larynx may be described as having a colour similar to that of the gums.

Beneath the level of the ventricles are seen the **Vocal Cords** (V C, Fig. 1). They are at once recognised as two lustrous, fibrous bands, running, when the glottis is closed in phonation, almost parallel in the antero-posterior direction of the larynx, and widely separating on inspiration, the widest space being posteriorly. Springing from the angle of the thyroid, and attached to the anterior angle of the base of the arytenoid, each cord is divided into two portions—the ligamentous or anterior, and the cartilaginous or posterior. The junction of these two portions is at the point known as the vocal process (V P, Fig. 2). The exact anatomical parts representing these processes are well shown on Fig. XII. 6 and 7, p. 22. The ligamentous portion of the vocal cords is seen to be of a glisten-

ing pearly grey or white colour, while the cartilaginous part is often slightly pink, especially in the case of those who are constantly using the voice. This is an important point to remember, as otherwise the appearance might be mistaken for the result of disease.

It is well to notice that in some cases, on looking into the larynx, the anterior commissure is not seen, but that the posterior wall, lying in contiguity with the œsophagus, is more visible (Fig. 6). In such cases it is often, but erroneously, inferred that there is thickening of the inter-arytenoid fold.

The amount of the **Infra-glottic** division of the larynx visible in the laryngeal mirror varies considerably in different subjects. Generally, the internal surface of the anterior portion of the cricoid cartilage (C C, Fig. 1), and two, three, or more rings of the trachea will be seen (T, Fig. 1). The cartilaginous rings are of a yellowish buff colour, whilst the interspaces are of the same hue as the laryngeal mucous membrane. In favourable subjects one may even see the tracheal bifurcation, with the openings of the bronchi (R B, and L B, Fig. 1), the right being the more visible.

On the outskirts of the larynx proper, but quite within the field of the laryngeal mirror, and always to be inspected, are the hyoid fossæ (H F, Fig. 1), one on each side, with the prominences of the cornua of the hyoid bone (C H, Fig. 2) showing through the mucous membrane. These cavities are of considerable surgical importance, as being the favourite locality of foreign bodies (PLATE VI., Fig. 54), and a frequent site of pharyngo-laryngeal cancer (PLATE XIII., Figs. 119 and 120).

On looking into the larynx by means of the laryngoscope in the manner described on p. 46, *et seq.*, we are enabled to follow the movements of the parts in the production of the various sounds. The shape of the rima glottidis during ordinary quiet respiration is somewhat elliptical (Fig. LXVIII., p. 105). If, however, the utterance of a sound (phonation) be attempted, the vocal cords are seen to be promptly approximated, and the superior thyro-arytenoid ligaments (ventricular bands) also move towards the middle line. These latter, however, *never* meet in phonation, and while they doubtless influence the quality of the voice, they are not directly concerned in voice production. As soon as sound ceases to be emitted, the cords quickly return to their previous position.

There is a position of the cords which is similar to that of quiet respiration, namely, when half-way between full abduction

and complete abduction. This has been termed by Ziemssen the 'cadaveric' position, from its being the condition found post-mortem. The two terms, however, are not synonymous. As a matter of fact, the width of the glottic opening is, in ordinary respiration, about twice as great as that found in the cadaveric position. The latter has a pathological interest in connection with certain disorders of innervation, which will be alluded to later on.

The process of approximation as just described is subject to various modifications. For instance, in 'aspirating,' the apposition is more gradually brought about, so that a certain quantity of air has time to pass through before the cords are brought into the phonation attitude. On the other hand, the closure may be absolute, either for the purpose of preventing the egress of air with a view to muscular effort, or as preliminary to that violent expulsive opening which constitutes 'cough.'

FIG. LXVII.—LARYNGEAL IMAGE —LOWER THICK REGISTER.

T T. Tongue.
P P. Ventricular bands.
L. Epiglottis.
S S. Cartilages of Santorini.
V V. Vocal cords.
W W. Cartilages of Wrisberg.

FIG. LXVIII.—LARYNGEAL IMAGE— UPPER THICK REGISTER.

T T. Tongue.
P P. Ventricular bands.
L. Epiglottis.
S S. Cartilages of Santorini.
V V. Vocal cords.
W W. Cartilages of Wrisberg.

For vocal purposes the cords ought to come together and be rendered suitably tense at the same time as the current of air is made to impinge upon them. By this means the musical note produced is clear and free from accessory sounds. On termination of the effort, relaxation and abduction of the cords should follow or be coincident with cessation of expiration.

It may be interesting at this stage to review briefly the changes in the position of the cords which take place during the production of the different registers; a *register being understood as consisting of a series of tones which can be produced by the same mechanism* (Behnke). When a very low note is uttered, the arytenoids are seen (when not hidden from view by the epiglottis, which is generally to some extent folded over the superior aperture of the larynx during the emission of very low notes) to be closely approximated poster-

iorly, leaving an elliptical opening between the cords (Fig. LXVII.). The ventricular bands are well out of the way, and allow of a good view of the cords in this position.

Somewhat higher in the scale the elliptical opening disappears, leaving a small triangular opening, with the apex pointing forward, between the processus vocales; this, in its turn, is no longer visible when, or before, the tone is raised to the higher A note of the bass clef (Fig. LXIX.).

These notes (up to the lower F of the treble clef) are all produced by the same mechanism, namely, by vibrations of the whole length, breadth, and substance of the vocal cords, which throughout this register are comparatively thick. Hence this series of tones is spoken of as the 'thick register.' As the upper limit is approached, however, the epiglottis straightens itself gradually, and the cords are evidently subjected to great tension. This is effected chiefly by the tilting forward of the thyroid cartilage through the agency of the crico-thyroid muscles, a process which can be *felt* by placing the finger on the outside of the throat.

FIG. LXIX.—LARYNGEAL IMAGE —LOWER THIN REGISTER.

T T. Tongue.
F F. Ventricular bands.
L. Epiglottis.
V V. Vocal cords.
S S. Cartilages of Santorini.
W W. Cartilages of Wrisberg.

To reach above this note without undue strain upon the cords, a different mechanism is brought into play. The epiglottis is raised still more, the upper part of the larynx (the vestibule) is made narrower and deeper, and the ventricular bands are brought nearer to one another. Moreover, by the contraction of the outer vertical fibres of the crico-thyroid muscles the diameter of the inner portion of the thyro-arytenoid muscles is diminished, and the vocal cords themselves are rendered flatter, thinner, and quite parallel. This series has been called the 'thin register.'

The thyroid cartilage resumes to a great extent its erect position, and the pre-existing strain is thus relieved. To raise the tone the same tilting forward of the thyroid again comes into play, and this suffices for about a fifth (to the middle C of the treble clef). The next change consists in the formation of an elliptical opening (Fig. LXX.) between the cords, in lieu of the linear slit which characterised the preceding register (Fig. LXIX.), and by this means the higher F may be reached.

Finally, in order to continue the ascending scale to the end,

the posterior parts of the vocal cords are held firmly together, leaving only a small oval orifice in the anterior part of the glottis, which becomes smaller as the voice ascends (Fig. LXXI.). This series has been called the 'small register,' and is only to be seen in the case of females and of boys.

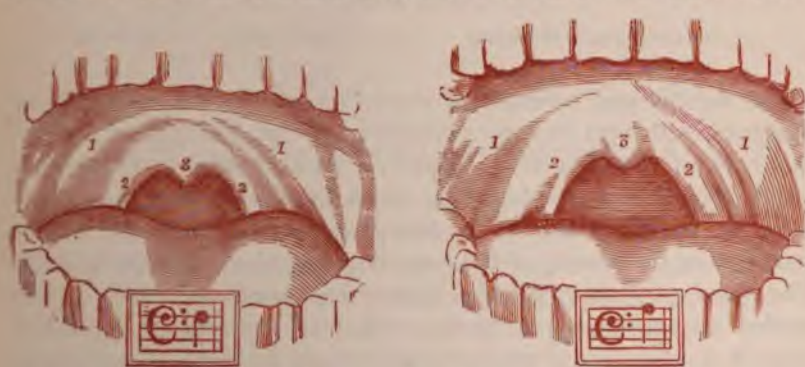
The *pitch* of the voice is thus altered (1) by the degree of tension of the vocal cords; (2) by their thickness and width, together with the condition (thick or thin, tense or lax) of their

FIG. LXX.—LARYNGEAL IMAGE —UPPER THIN REGISTER.

FIG. LXXI.—LARYNGEAL IMAGE— SMALL REGISTER.

free margins; (3) by the shortening of the vibrating surface caused by the close juxtaposition of more or less of their edges posteriorly; and, finally, (4) by variations in the pressure of the expired air.

It must, however, be borne in mind that the positions of the soft palate and uvula are also changed to some extent according to the pitch of the different tones; that the *quality* of the voice is materially affected in this region by the degree of approximation of the soft palate to the back of the pharynx, and by the greater or smaller amount of nasal escape of the tone consequent there-

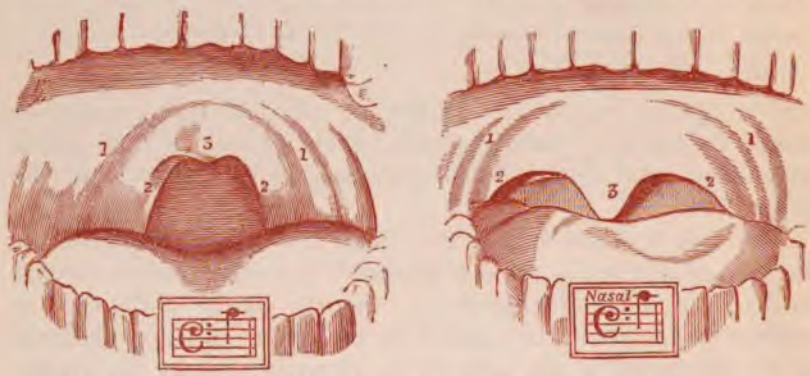


FIGS. LXXII. AND LXXIII.—THE SOFT PALATE IN TONE PRODUCTION.
1. Anterior pillars of the fauces. 2. Posterior pillars. 3. Uvula.

upon. Fig. LXXII. shows the palate in singing F. The shape of the arch 2, 3, 2 should be remarked in order to compare it

with Fig. LXXIII., which shows the soft palate in singing the A, and in which the palate is seen to be much higher than in Fig. LXXII. The next drawing (Fig. LXXIV.) represents the shape of the faucial arch in singing the note C; it is both higher and narrower than before, while the uvula has contracted so much as to have almost completely disappeared. With the palate so raised and contracted the tone sung is pure and resonant.

The same note may be produced with the palate relaxed and the uvula pendant (Fig. LXXV.); but it is strongly nasal in tone, and is greatly wanting in resonance. In order to avoid any misapprehension as to the meaning of terms often employed as interchangeable, it is convenient here to say that *nasal resonance* is intended by me to signify the *normal* quality of tone accompany-



FIGS. LXXIV. AND LXXV.—THE SOFT PALATE IN PURE PRODUCTION AND WITH NASAL TONE.

1. Anterior pillars of the fauces. 2. Posterior pillars. 3. Uvula.

ing a *healthy* and unimpeded condition of the naso-pharyngeal passages, with firm closure posteriorly of the soft palate against the back of the pharynx. *Impaired* nasal resonance, or *deficient* nasal resonance, is produced by anything that blocks these passages, as polypi of the nose, adenoid growths in the vault of the pharynx, or thickening of the naso-pharyngeal mucous membrane. The term *nasal tone* signifies something *abnormal*, except when applied to pronunciation of the two nasal consonants *m* and *n*, since it implies escape of the tone through the nostrils, by imperfect contraction of the soft palate against the pharynx. The first defective condition exists in the 'dead' tone of a person speaking with a cold in his head; the second when he is the subject of a relaxed or paretic soft palate. It is quite possible for nasal tone to exist in combination with defective nasal resonance; but the

two terms represent two distinct and different conditions, and need never be confounded in significance. The figures here inserted are tracings of photographs from life, and the whole subject has been treated in detail in *Voice, Song, and Speech.* (See also *British Medical Journal*, October 27, 1883.)

Auto-laryngoscopy.—A great deal of the difficulty which is experienced by beginners in obtaining a good view of the larynx, is attributable, not so much to intrinsic sensitiveness of the parts

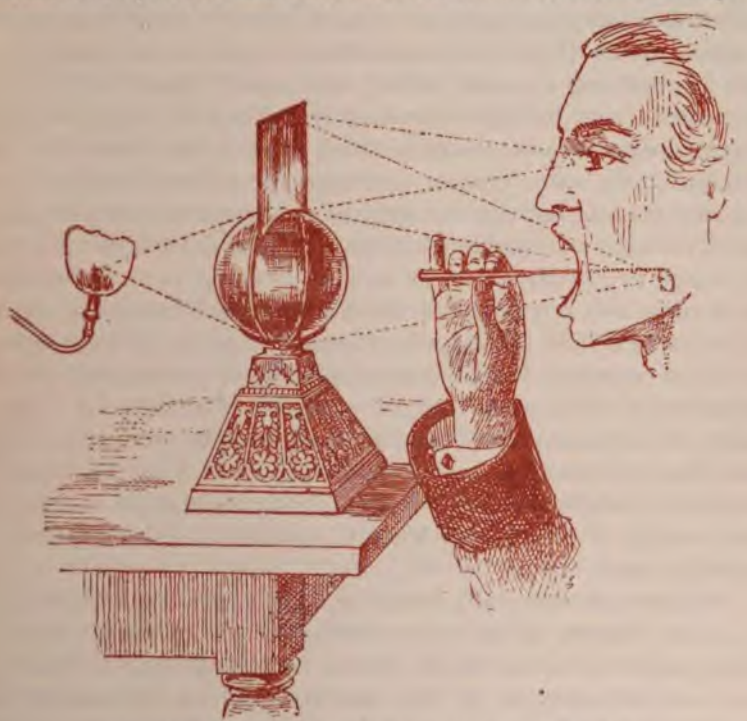


FIG. LXXVI.—THE AUTO-LARYNGOSCOPE OF FOULIS.

to be examined, as to a want of delicacy and management. One of the best ways to acquire this *tactus eruditus*, and at the same time to become familiar with the appearances of a (presumably) healthy larynx, consists in practising a systematic investigation of one's own throat. No additional apparatus is required beyond a small mirror, which is so placed that the observer is enabled to see the reflection of the laryngoscopic mirror when placed *in situ* in his own throat. A very ingenious little contrivance was invented for this purpose by the late Dr. Foulis, of Glasgow, consisting of a glass globe filled with water, and surmounted by a small square mirror (Fig. LXXVI.). The rays from a candle or

lamp placed behind the globe are by this means concentrated into the open mouth of the observer, who sits in front of it, holding the laryngeal mirror at the back of the throat in the manner already described. He will thus be enabled to see the resulting image in the larger mirror fixed to the globe.

Photo-laryngoscopy.—It was only to be expected, as a natural sequence of seeing into the larynx, that attempts should be made to reproduce its image by means of photography; and indeed Czermak, who appears to have left very little unattempted in connection with the subject, succeeded, upwards of twenty years ago, in obtaining a picture which, although it bears on the face of it evidence of having been much retouched, is, considering the length of exposure necessary in those days, a very wonderful production. Our own process consisted in concentrating a very powerful electric light on Mr. Behnke's pharynx, he being so seated that, by means of a mirror inserted into the shutter, he could see the image in exactly the same axis as it would be in the camera. His tongue was not drawn forward, but was left flat in the mouth, so as not to distort the laryngeal image. When we were agreed as to the moment for photography he gave the signal, and an exposure of about a quarter of a second was allowed. As a result, we obtained some marvellously perfect portraits, which have been published in our joint work, *Voice, Song, and Speech*, and were exhibited by me, on magic-lantern slides, at the Liverpool meeting of the British Medical Association in 1883, on two successive days.

We were exceptionally fortunate, first, in the facilities afforded us at the Society of Arts for obtaining a magnificent Siemens electric light of 10,000 candle power, for the purpose of illumination; and, secondly, in the fact that Mr. Behnke, who sat for the photographs, had, by long practice, become thoroughly accustomed to the laryngeal mirror, and had also acquired the art of demonstrating his larynx not only at rest, but also in tone-production in the various registers.

Dr. French, of Brooklyn, who for many years was working at the subject on individuals totally untrained, succeeded, after much patience, in producing very good photographs on a minute scale, capable of enlargement and reproduction. To this gentleman belongs the honour of having first obtained a photographic image of portions of the posterior nares.

Transphotography and Illumination in the Upper Respiratory Region.—These are the terms I venture to suggest for the process by which, through the penetration of X rays, images

of deep-seated tissues can be obtained. What is photographed is as real a picture of the object as if it were on the surface, or that, say, of a face behind a veil, and the words shadowgraph and skiagraph are therefore misleading.

Nothing, perhaps, could better illustrate the high standard of scientific education at the end of the present century, than the fact that immediately on the announcement of Röntgen's discovery of the X rays, workers were ready to take up the subject and to advance its development in every physical laboratory throughout the civilised world. Unlike many new discoveries, this one of Röntgen has never passed through the stage of contempt or indifference. On the other hand, the ease and rapidity with which difficulties have been overcome, and the almost daily record of the many new directions in which the procedure can be applied, have anticipated charges of exaggeration of its importance, or fears of limitation in the possibilities of its future usefulness.

It is to the honour of British laryngology that one of its most esteemed disciples — John Macintyre of Glasgow — has contributed much valuable and original information towards the solution of many of the physiological mysteries of the upper respiratory passages, and has successfully applied the discovery to more expeditious and accurate diagnosis of several obscure diseases in these regions, prematurely condemned as inaccessible to the rays of the new light. For example, on 10th April 1896, having read in the *British Medical Journal* on the morning of the same day that 'the cartilages of the larynx are transparent to the X rays, and afford no clear landmarks in the picture,' I had, on the afternoon of the same day, an opportunity of seeing transphotographs of all the cartilages of the larynx thrown on a magic-lantern screen by Macintyre at a meeting of the British Laryngological Association.

Concurrently with, or rather it might be said as an essential to, such a delicate application of the X rays, we owe to the same worker immense reduction of the time occupied for exposure. On first announcement of the discovery some thirty or forty minutes were required to take a transphotograph of the bones of the hand. Macintyre was the earliest to succeed in obtaining a picture of the same object, and of others less accessible to the rays, in 'the unknown fraction of a second.'

In view of certain untoward results, recorded as produced by the influence of the rays on the skin, hair, etc., the value of this instantaneous exposure can hardly be too highly estimated.

It would be clearly out of place to attempt to describe in these pages the various portions of the necessary apparatus and procedure with sufficient detail for practical application.

It must be simply recorded that at the moment of writing—within two years of Röntgen's epoch-making announcement—we are able to say that—

The apparatus is already far less cumbersome and costly.

1. The period of exposure has been much reduced.

2. The efficiency of the fluorescent screen has been increased, and screen pictures or photographs of many internal organs in the neck and thorax have been obtained.

FIG. LXXVII.—INSPECTION OF LARYNGEAL REGION (MACINTYRE).
M, Mirror; S, Screen; X, Rays; T, Tube.

3. By taking advantage of the different densities of organs, and by correct exposures and careful regulation of the distance of the tube from the plate, photographs of some of the soft tissues of the body have been obtained with almost equal definition as of the hard.

4. Transphotographs have been taken of moving bodies, *e.g.* the limbs of a frog, with such rapidity that the movements of the joints can be demonstrated by the cinematograph.

We may thus hope in the near future to obtain serviceable records of many of the movements of parts of the human body, as, for example, those of the heart, the diaphragm, the vocal cords, etc.

Macintyre has devised special apparatus for examination of the oral, pharyngeal, and laryngeal cavities, by means of the fluorescent screen; also by nice adjustment of screen and rays, which represents the technical essentials of success, he has reduced to a minimum the intervening obstacles when inspecting deep parts.

Without, as I have said, attempting any elaborate description of the whole process of transphotography, with minute details on such technical points as sources of current, rheostats, coils, con-

densers, interruptors, tubes, stands, fluorescent screens, etc., it may be interesting and useful to append two diagrams, illustrative of the method of employment of small screens in the buccal cavity, for inspection of the structures of the laryngeal region (Fig. LXXVII.), and of the upper maxillary region, nasal fossæ, etc. (Fig. LXXVIII.).

I quote the following explanatory description of these diagrams from an article by Macintyre in *The Practitioner* for January 1897:—'A glance at the plates here reproduced will explain the theory. If the upper part of the face is to be examined, the focus-tube is placed above the patient's head, and the fluorescent screen, in the form of a tongue depressor, is put into the mouth. The shadow of the parts or a foreign body will be seen on the under surface, as this is ordinary light. The introduction of a mirror facilitates the examination. For the examination of the parts in the lower maxillary region the tube must be placed below the level of the jaw, and the tongue depressor introduced with the surface covered with the salt downwards. Accuracy of definition will be obtained in proportion as the force at our disposal allows us to withdraw the tube a further distance, for reasons which need not be here detailed. As these salts are poisonous they must be covered in with a thin aluminium plate.'

FIG. LXXVIII.—INSPECTION OF UPPER MAXILLARY REGION, NOSE, ETC. (MACINTYRE).
M, Mirror; S, Screen; X, Rays; T, Tube.

'The patient, or the part which is to be examined, must be placed between the Crookes's tube and the fluorescent screen, or, in the case of photography, between the tube and the photographic plate. It will be found by experiment that three important factors have to be noted in order to obtain the best

results—First, **penetration**; secondly, **definition**; thirdly, the **elimination of structures** that may lie in **front** of or **behind** the particular organ or part of the organ which is to be examined.

'With regard to the question of **exposure,** with the most powerful apparatus photographs of the neck or larynx would only occupy a few seconds, with the medium current a matter of a few minutes.

'The examination of the upper part of the respiratory tract necessitates the application of the rays to the detection of changes in the soft as well as in the hard tissues. When the rays were first brought under the notice of the medical profession, the question naturally arose, Will the soft tissues ever be photographed? This has been accomplished, and photographs have been taken and shown at a meeting of the British Laryngological Association, of the neck, base of the tongue, hyoid bone, epiglottis, arytenoid cartilages, etc. At the same time I had been experimenting in the region of the heart, liver, and kidney, with the result that it was found possible to demonstrate some, if only a few, pathological changes in these regions.

'I have frequently photographed the structure of the larynx in the living subject, by simply placing a small quarter plate against the side of the neck and the tube at a distance of 8 in., and that with the exposure of a minute or two with a medium current.'

The following list of the transphotographic pictures taken by Macintyre gives an encouraging, albeit an incomplete record of the pathological conditions in our special domain in which the rays have already been found of value:—

1. **Foreign** bodies in antrum of Highmore, larynx, mouth, and œsophagus.

2. **Injury.**—Fracture of hyoid bone, superior maxillaries, etc.

3. **Tumours.**—(*a*) Jaw; (*b*) Destruction of upper maxillary bone from malignant disease, aneurism in chest, etc.

4. **Thorax.**—Fluid in pleural cavity, deposit in apex of lungs, etc.

5. **Various.**—Other conditions, such as Ossification in Cartilage of Larynx, Anatomical Specimens of Internal Ear, Inside of Cranium, Mastoid, etc.

It may be added that the X rays have been employed for the purpose of determining the position of the vocal cords in the various registers of the singing voice; and that more recently Schiff of Vienna is proposing to employ them so as to bring about curative changes in lupus.

CHAPTER VII

RHINOSCOPY, OR EXAMINATION OF THE NASAL PASSAGES—THE RHINOSCOPIC IMAGE

RHINOSCOPY, or investigation of the upper pharynx and the interior of the nose, has become inseparably connected with laryngoscopy, not only because of the similarity of the methods of investigation, but for anatomical and pathological reasons. For experience has taught us that in many diseases of the throat we must look to previous or simultaneous affections of the mucous membrane and submucous tissues of the nose and pharynx for their etiological elements. As a natural result, the employment of the rhinoscopic speculum and mirror has led to a greatly extended study, and a consequently more perfect knowledge of the various morbid processes in the regions so brought under observation. The increased visual command thus gained has also led to improved methods of medication, and to greater accuracy in the local application of remedies to these passages.

Anterior Rhinoscopy.—Much information as to the condition of the nasal cavity may be gained by careful inspection from the nostrils, although the comparatively small size of the aperture of necessity greatly limits the field of observation. Light, either direct or reflected, is again called into requisition, and the view of the nostrils facilitated by the use of a suitable speculum or dilator. In nasal—and, indeed, in all—instruments the great object should be to have them as simple as possible; but this is by no means universally borne in mind by instrument makers and surgeon-inventors.

Duplay's speculum (Fig. LXXIX.) was one of the first introduced, but is of rather cumbersome construction, and heavy. It is, moreover, not self-retaining. Fränkel's speculum (Fig. LXXX.), until recently in general use, is only moderately serviceable, from the fact that the small space brought into view is still further narrowed by prolapse through the fenestrations of the tissues attempted to be dilated. The same objection applies to Cohen's

hairpin speculum, useful as it is for cases of emergency; and to the instrument of similar construction suggested by Baber, which is made self-retaining by a rather terrifying arrangement of bands and buckles. Many years ago I had a Fränkel's speculum made with the fenestrations filled up, and they can be procured of that form. A further improvement has been effected by a screw, fixing the blades at the desired point of dilatation; but the instrument is at best an inconvenient one, from the peculiar curve of its dilating blades, as also from their undue length and narrowness. This last defect, that of narrowness, is an objection also to Shurley's speculum, an otherwise good instrument as far as the shape and length of the blades are concerned. The principle of Thudichum's instrument is sound, except that the spring is so strong as generally to cause great discomfort, and in some cases actual pain, to the patient. I formerly used the trivalve nasal speculum of Elsberg, to which was added, at my suggestion, a rack to keep it open at any desired width. The instrument (Fig. LXXX.) which I have now employed for the last ten years, to the exclusion of all others, was suggested in the first instance by that of Maunder for straightening the septum. The blades are of the same shape as those of Thudichum's speculum, but are made of ivory instead of metal, so as to be more readily serviceable when the cautery is used. The bridge connecting the blades is shortened by a telescope arrangement; and, being slightly resilient, allows of a delicate adjustment of the spring force sufficient for self-retention, but not enough to cause pain or even discomfort. I have, however, seen an 'improvement' of my instrument,

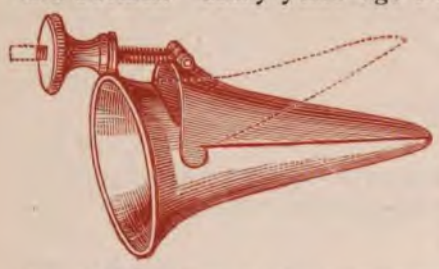


FIG. LXXIX.—DUPLAY'S NASAL SPECULUM.

FIG. LXXX.—FRÄNKEL'S NASAL SPECULUM.

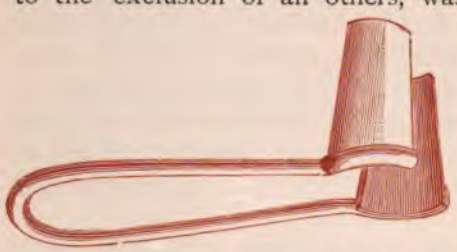


FIG. LXXXI.—THUDICHUM'S NASAL SPECULUM.

which was of such a nature as to have improved away every feature of good that I venture to think it possesses. The blades were of metal, the bridge was rigid, and the amount of expansion was regulated by a screw. A nasal speculum made of wire, like an eyelid retractor, is much in use with Transatlantic rhinologists. The one illustrated (Fig. LXXXIII.) was given me by Dr. Palmer of Toronto. Its advantage is its lightness. Its drawbacks are, first, the liability of mucous membrane to prolapse through; and, secondly, its unsuitability in the case of intransal galvano-cauterisation.

FIG. LXXXII.—AUTHOR'S NASAL SPECULUM (NEARLY FULL SIZE).

I have found little benefit from the use of long tubes to be introduced into the nostrils as suggested by Zaufal, the area of inspection being too limited, and the view gained being equally attainable in most cases by posterior rhinoscopy. Moreover, their introduction is generally attended by both pain and hæmorrhage.

The following are the steps necessary to be taken for the anterior examination of the nose. The patient being seated, with the head thrown back and rested on the back of the chair, the observer, who sits in front of him, gently introduces the dilator and fixes it in position. The light is then focussed on the nostril to be examined, the entrance to which will then be seen as an irregular oblong opening, and on dilatation the contents of the anterior nares come into view.

FIG. LXXXIII.—PALMER'S WIRE NASAL SPECULUM.

Before describing these, it may be noted that for anterior rhinoscopy to be serviceable it is essential that the operator should be thoroughly acquainted with the anatomical relation of the parts he wishes to see; but as, with the best of specula, the field of vision is limited, he is obliged to frequently alter its axis in the direction of the different passages; and no observation can be considered complete unless the examination is thus conducted. The planes of the different parts to be inspected are so variable, however, that it is quite impossible by any sort of figure to give

a useful and clear impression of what one desires to convey to others, however serviceable such an outline may be to the observer for his own purposes of record. There are a large number of variations, especially of the septum and of the inferior turbinated body, as well as others depending on the degree of patency of the nostril itself, which very seriously alter the image, but which are by no means pathological, just as there are differences in the external configuration of the nose. For all these reasons, and after full deliberation, I have decided not to give any outline conventional figures of the anterior nares as first adopted by Seiler in 1879, and such as I have so long recommended for the graphic record of pathological changes in the fauces, larynx, and posterior nares.

The Anterior Rhinoscopic Image.—The first object to notice is the median septum, which separates the nostril from its fellow, and is often deflected to one or other side. On the outer wall the inferior turbinated body is visible, and forms the roof of the inferior meatus of the nose, at the far end of which, in favourable cases, may be seen the movement of the palatal muscles in swallowing. By altering the axis of vision, the middle and even—in very rare cases—a portion of the superior turbinated bones may be perceived.

The *septum* so frequently deviates from the mesial line, that unless there is difficulty in nasal respiration, not accounted for by other circumstances, no clinical importance need be attached to the fact. Baber has the merit of first drawing attention to the importance of the *tubercle* of the septum, the varying forms and position of which may greatly influence the appearance of the anterior rhinoscopic image; but it may be mentioned that its actual existence is by no means universal. On the other hand, not only at the situation of the tubercle, but along the lines of suture, distinct osteo-cartilaginous spurs are not infrequently met with. Even when these do not interfere with the respiratory function of the nostrils, they may bear causal relation to certain reflex neuroses (see Chapter XII.). The *inferior turbinated body* is the part which next claims attention. It varies greatly in size and colour within the limits of health. Its mucous covering is soft and smooth, and when congested or swollen is sometimes mistaken for a polypus. At the lower border of the inferior turbinal may be seen the *inferior meatus*. The *middle turbinal* lies far higher up, and for its inspection it is necessary that the head of the patient be set further back. The portions seen on anterior examination are

the anterior and inferior surfaces. At the outer edge is the *middle meatus*, on the inner the *olfactory slit*. The *superior turbinal* is but very rarely visible by anterior rhinoscopy. The *coloration* of the parts seen from the front differs somewhat from that of the same structures as viewed by posterior rhinoscopy. The inferior turbinated body is of a vivid red; the septum is also distinctly red, but of not so strong a hue, while the middle turbinated body and the olfactory area, not often seen, are of a still paler tint.

Posterior Rhinoscopy is to all intents and purposes the same process as laryngoscopy, except that the laryngeal mirror is turned upwards to obtain a view of the posterior nares, and is, when used for this purpose, called the *rhinal* mirror. Rhinoscopy is a more difficult process than laryngoscopy, inasmuch as the causes of failure, due to natural conformation of the parts, are more numerous. Of these the following are the principal:—

α. The arching up of the dorsum of the tongue.

FIG. LXXXIV.—WHITE'S SOFT PALATE RETRACTOR.

β. Irritability of the pillars of the fauces, and of the posterior wall of the pharynx.

γ. Enlarged tonsils and uvula.

δ. Insufficient distance between the uvula and posterior wall of the pharynx.

In laryngoscopic examination, as has been pointed out, it is not necessary to touch the pharynx or fauces, but in using the rhinal mirror it is often impossible to avoid doing so. The third difficulty is the greatest, and to overcome it many instruments have been suggested to draw the uvula forward, and so to increase the area open to inspection; but they are seldom employed either by my colleagues or myself. As a matter of experience, I have long come to the conclusion that, while ease and completeness of post-rhinal examination depend almost entirely on the amount of space at command between the uvula and the posterior pharyngeal wall, so also does this condition favour disease in the region under consideration—that is to say, the wider the distance between soft palate and pharynx, the more surely one may expect, on examination, to find post-nasal trouble.

This little fact is one of some consolation where a rhinoscopic examination is unsatisfactory on account of the contrary relation

FIG. LXXXV.—CURVE OF SHANK OF MIRROR, AND POSITION OF HAND NECESSARY FOR RHINOSCOPY.

of these parts. Occasionally, however, a retractor of the uvula may assist the observer, and for this purpose that of White, of

FIG. LXXXVI.—FRÄNKEL'S RHINOSCOPIC MIRROR (ONE-HALF MEASUREMENTS).

Richmond, Virginia, U.S.A. (Fig. LXXXIV.), may be specially commended.

The steps necessary in making a rhinoscopic inspection are exactly the same as for the laryngoscopic, up to No. 6 (see page 85); but the mirror used must be of the smallest size in Fig. LI., and should be curved so as to take the shape of the floor of the mouth (Fig. LXXXV.). My own examinations have always been made with the small-sized laryngeal mirror, suitably curved, as shown in this illustration. The instrument known as Fränkel's (Fig. LXXXVI.) enables the surgeon, by means of a sliding lever, to vary the angle of the mirror, by a simple movement of his thumb. Though in general use by many surgeons, it has not been found necessary for employment in ordinary examinations in my own practice; but it will be found convenient in those cases in which the space between the soft palate and back of the pharynx is unusually narrow.

As in inspection of the fauces, so also in rhinoscopy, some form of tongue-depressor is often indispensable; and although Stoerck and Voltolini have each devised an instrument which combines in itself mirror and depressor, they have acknowledged that nothing is gained by such an arrangement, except that it leaves one hand of the examiner free; while it possesses the decided disadvantage of limiting the movements of the mirror so essential to successful rhinoscopic observations. For this purpose I prefer a Fränkel's tongue-depressor (Fig. LVII.).

As before stated, the patient is placed as for laryngoscopic examination, except that the head is inclined slightly forward instead of backward. This procedure is important for two reasons—first, because it brings the more anterior portions of the nasal fossæ in a direct line with the light reflected from the rhinal mirror; and, secondly, because such a position allows the pendulous portion of the soft palate to fall away from the posterior wall of the pharynx. Carl Michel, of Cologne, also advises that before opening the mouth the patient should place it in the position of a broad grin, as in this situation the soft palate is more pendulous. Experience justifies me in endorsing this recommendation. The tongue, unless under control of the patient, is now depressed gently but firmly, care being taken not to use more force than is necessary. The mirror is introduced with especial care not to touch either tongue, palate, or wall of the pharynx (this is not difficult), the body of the mirror being sidled beneath the arch of the palate, and then turned into proper position, by placing its handle parallel with the long axis of the tongue, and its face looking upwards and forwards. The tendency of the velum to contract and cut off the light from

the mirror is best counteracted by directing the patient to breathe slowly through the nose, and at intervals to emit a long-drawn groan, both of which proceedings cause the whole to relax and remain flaccid.

There are, nevertheless, cases where, from various causes, the distance between the soft palate and the posterior wall of the pharynx is too small to admit of ordinary rhinoscopy, and possibly also some in which it is desirable to have increased space for the removal of growths, etc. In such contingencies the following measure has been recommended. With a Bellocq's cannula, pass a strip of small-sized soft rubber tubing (such as is used for drainage in small wounds) through the inferior nasal passages, and, drawing one end through the mouth, tie it to the portion left projecting from the nostrils. By this means the velum palati is folded upon and held close in contact with the roof of the mouth, and cannot therefore interfere with the reflection of light into the posterior nares. This proceeding is said to be only at first attended with a few spasms of sneezing and retching, which, however, soon pass off, and the bands may then be left *in situ* for ten or fifteen minutes without occasioning pain or excessive discomfort. I have, however, rarely found it needful to resort to such elaborate measures; but when adventitious aid is necessary, and also in some operations in the post-nasal space, the palate-hook of White is of real service, and can be employed without discomfort if the soft palate has been previously cocainized; for with a view of lessening the sensitiveness of the parts, I

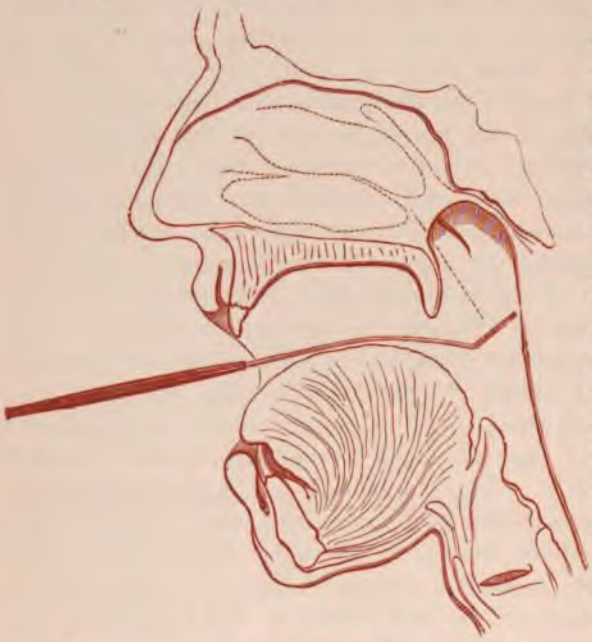


FIG. LXXXVII.—SECTION SHOWING POSITION OF MIRROR AND PATIENT'S HEAD FOR OBTAINING A RHINOSCOPIC IMAGE.

am now, in common with most other practitioners, in the habit of applying to the velum and fauces a five or ten per cent. solution of hydrochlorate of cocaine. This subdues the reflex excitability of the mucous membrane, and diminishes the discomfort attending these kinds of manipulations.

Digital Examination of the posterior nostrils is of the highest utility, and should never be neglected in the case of children, as it often affords most valuable information, especially when the result of a visual inspection has been unsatisfactory. It is, however, necessary for this purpose that the observer should thoroughly know the relative anatomical positions of the parts, and also the character of the sensation which each gives to the examining finger. The procedure should, of course, only be resorted to after the mirror examination, which would otherwise be rendered impossible; and one of the finger-guards already described is desirable. The process is disagreeable rather than painful; it is sometimes followed by more or less hæmorrhage, which is not, however, of importance, except as a diagnostic indication.

Preliminary to making the examination, especially in children, the head, with the exception of the face, should be enveloped in a large towel, the two ends of which may be made to cross the arms, and if held firmly by a nurse or assistant, restrain movement as effectively as would a strait-jacket. The surgeon should then place the head so covered under his left arm, steadying it with the corresponding hand, one finger of which presses in the patient's cheek so as to act as a gag; then deftly introducing the right index finger as far back in the throat as the posterior pharyngeal wall, he should turn it upwards behind the uvula. Spasm is soon overcome, and then, *with the septum as a guide*, the whole of the space between the Eustachian opening and the vault of the pharynx can be explored. It should be smooth and free from prominences. The posterior portions of the inferior turbinated bodies can also be examined in this way for evidences of the presence of hypertrophies and new growths. Care should be taken not to mistake the cartilaginous lip of the Eustachian orifice (Fig. LXXXVIII. 15) or the internal pterygoid process for a morbid induration.

Some writers on this subject recommend the use of a nasal probe in order to determine the mobility, etc., of the parts brought into view, but this practice cannot be recommended for general adoption any more than the use of a similar instrument in the larynx, unless the membrane has been previously anæsthetized, since the irritation and resulting reflex movements, with in some

cases also hæmorrhage, will materially impede and sometimes altogether prevent any further examination. To obtain local insensibility I employ small pledgets of cotton-wool soaked in a 20 per cent. solution of cocaine, which, being placed in the nostril, are left there for at least fifteen minutes. The nasal probe, although to be used with caution, is of great value in determining the consistence and attachments of new growths, the existence of necrosis, the presence of foreign bodies, etc.

The Posterior Rhinoscopic Image (Figs. LXXXVIII. and LXXXIX.).—A view of the post-nasal passage is not only more difficult to obtain, but is less easy for the beginner to realise in detail, since the small amount visible in the mirror

FIG. LXXXVIII.—THE POSTERIOR RHINOSCOPIC IMAGE.

1. Septum.
2. Middle turbinated bone.
3. Inferior turbinated bone.
4. Superior turbinated bone.
5. Superior meatus.
6. Middle meatus.
7. Inferior meatus.
8. Main passage of nostrils.
9. Vault of pharynx and pharyngeal tonsil.
10. Cushion of soft palate.
11. Posterior surface of uvula.
12. Ridge formed by levator palati.
13. Salpingo-pharyngeal fold.
14. Salpingo-palatine fold.
15. Eustachian prominence or cushion.
16. Fossa of Rosenmüller.
17. Eustachian orifice.

at first sight, and the different angles at which the mirror must be turned, may sometimes create a difficulty in identifying what is seen. It becomes necessary, therefore, to alter the position of the mirror so as to obtain a series of views; and only practice will enable the observer to compare these, so as to form an accurate judgment of the condition of the entire cavity. For these reasons the depicted image must always be of a composite character. Comparison of the rhinoscopic image in Fig. LXXXVIII. with that of the posterior nares, as seen on dissection in Fig. LXXXIX., will greatly facilitate appreciation of the various structures and of their relative situations.

The septum (1) divides the posterior nares into symmetrical

halves, and this line is a useful guide to the relative positions of the various parts. It is thin and pale in colour, the mucous membrane being firmly attached to the bone underneath. The posterior nares, two oval spaces, bounded by the vomer or septum on one side, and the external wall of the nostril on the other, will now be observed, and in their respective positions the middle (2), the inferior (3), and the superior (4) turbinated bodies. The first-named is the one which is seen most completely, the other

FIG. LXXXIX.—VIEW OF THE POSTERIOR NARES, THE PHARYNX BEING LAID OPEN FROM BEHIND (AFTER LUSCHKA).

B. Basilar process.
P. Pharynx.
1. Septum.
2. Middle turbinated bone.
3. Inferior turbinated bone.
4. Superior turbinated bone.
5. Superior meatus.
6. Middle meatus.
7. Inferior meatus.
8. Main passage of nostrils.
9. Vault of the pharynx and Luschka's tonsil.
10. Cushion of the soft palate.
11. Posterior surface of uvula.
12. Ridge formed by levator palati (L.P.).
13. Salpingo-pharyngeal fold.
14. Salpingo-palatine fold.
15. Eustachian prominence or cushion.
16. Eustachian tube, closed on the left and laid open on the right side.
17. Eustachian orifice.

two being only visible in part. There may be considerable departure from symmetry in these structures, a condition by no means necessarily abnormal. Between the various spongy bones on each side may be seen the superior meatus (5), middle meatus (6), and inferior (7)—and the space between the inner boundary of the turbinals and the meatus is the open passage of the nostrils (8). At the upper part of the image, above and behind the vomer and the boundary of the nasal orifice, can be seen the

vault of the pharynx (9), with the masses of adenoid tissue constituting the pharyngeal tonsils of Santorini and Luschka. The lower boundary of the posterior, and a portion of the inferior, turbinated bone is cut off from view by the posterior wall of the velum (10), which, as well as the posterior surface of the uvula (11), is seen at a still lower level, the colour of these parts being a florid red. At the lower portion of the naso-pharynx, and external to the nasal fossa, slightly below the level of the middle meatus (12), is seen a cup-like depression of oval shape, and with elevated edges: this is the orifice of the Eustachian tube (17). The inner ridge is formed by the salpingo-palatine fold (14), the outer by the salpingo-pharyngeal fold (13); while below is seen the elevation formed by the levator palati muscle. The upper margin of the Eustachian tube, as seen in the mirror (in reality the posterior border), is formed by its posterior cartilaginous wall, which is very prominent: it is known as the Eustachian cushion (15), and it forms the anterior boundary of the fossa of Rosenmüller (16). This last-named depression lies above and externally in the image; posteriorly, in fact, to the tube itself. It is of clinical importance as being very commonly mistaken for the tubal opening itself by those unaccustomed to pass the Eustachian catheter.

The mucous membrane of the naso-pharynx is, in the normal state, generally of brighter hue than that of the lower pharynx—an important point to remember in practice. The septum and Eustachian orifices are pale, and the turbinated bodies of a pinkish grey. The lower turbinated body is paler in tint than the others, and of more uneven, sponge-like surface—a detail which has been overlooked in most coloured illustrations, and was unfortunately not well represented in my own. This coloured drawing is not, therefore, reproduced in this edition, and is replaced by the wood engraving, which is in all respects a more faithful representation. The roof of the pharynx is redder than the parts of the nasal passages just described, and is of more or less uneven surface, owing to the presence of the adenoid tissue already mentioned. The pharyngeal bursa of Luschka, which has been invested with so much importance by Tornwaldt, can sometimes be recognised, on the posterior wall, by the presence of mucus at its orifice. Its situation is variable, and indeed it is by no means always present.

CHAPTER VIII

THE GENERAL SEMEIOLOGY OF THROAT DISEASES.

IN reporting a case of throat disease, after the facts dealing with identity, predisposing and exciting causes, etc., have been stated, it will be well, in order to simplify matters, to classify the **symptoms** under the following headings:—

(A) FUNCTIONAL or SUBJECTIVE, including impairment of the functions of voice, respiration, deglutition, and, in many pharyngeal and nasal diseases, of the special senses of hearing, smell, and taste; also the phenomena of cough, and the amount and character of expectoration, and of mucous and salivary secretion. Pain, irrespective of exercise of function, and nervous phenomena, such as that known by the term *globus hystericus*, may, in addition, be considered under this heading.

(B) PHYSICAL or OBJECTIVE, embracing all the appearances viewed by the observer, within the buccal cavity and the passages of the throat and larynx, special reference being given to alterations in colour, form, position, and mobility.

(C) MISCELLANEOUS and COMMEMORATIVE, which include those presented on external examination, as well as those which affect the constitution generally. Here may also be included examination of the chest, of the auditory apparatus, and of the nasal passages.

The following tabulated list of symptoms will, it is thought, facilitate reference in future; each of the various classes of symptoms can then be considered in detail. The arrangement is that which I devised for use at the Central Throat and Ear Hospital for the taking of cases requiring detailed notes. An abridged form is employed for those of less interest, and the various appearances on visual inspection are inscribed as occasion may require on one of the outline forms (Fig. XC.), which first were introduced at that institution, and are kept in books with adhesive backs for application to the case papers.

A. Functional or Subjective Symptoms:—

1. **Voice** may be
   - Modified in tone, power, and endurance.
   - Hoarse, husky, thick, guttural, or nasal.
   - Aphonic or polyphonic.
   - Jerky.
   - Shrill or squeaky.
   - Attended with pain or fatigue (mogiphonia or odyphonia).

(**Articulation** may be impaired irrespective of phonetic quality.)

2. **Respiration** may be embarrassed
   - Slightly, on exertion.
   - Continuously.
   - Spasmodically.

   } May be painful. Embarrassment may be laryngeal or pulmonary.

Note—and if necessary test with spirometer—vital capacity, and observe whether respiratory act is full and abdominal, lateral or costal, or exaggerated to clavicular elevation.

3. **Cough** may be
   - Irritable.
   - Hacking.
   - Painful.
   - Paroxysmal.
   - Continuous.

   On rising. After exertion. After meals. On change of temperature.

   } With or without expectoration or hæmorrhage.

Its phonetic character may vary, and be
- Hoarse.
- Barking.
- Metallic.
- Stridulous.
- Aphonic.

4. **Deglutition** may be
   - Difficult (*Dysphagia*).
   - Painful (*Odynphagia*).
   - Impossible (*Aphagia*).

   } Varying with consistence and temperature of food.

Nasal Symptoms:—

5. **Nasal respiration** may be impaired, or altogether obstructed, in one or both nostrils.

N.B.—Dryness of throat and mouth on rising is an almost invariable symptom of mouth-breathing due to nasal stenosis. Inquire as to snoring. Examine odour of air expired through the nose.

6. **Senses** of **smell** and of **taste** may be
   - Impaired, or Absent, or Abnormal.

   } Temporarily. Permanently.

Aural Symptoms:—

7. **Hearing** may be (in pharyngeal and nasal disease only)
   - Impaired.
   - Abnormally acute.
   - Painful.

   } Temporarily. Permanently.

Note facts concerning aural discharges, vertigo, and tinnitus.

[For further details of aural symptoms see 'Special Aural Forms,' published by Messrs. Bailliere, Tindall, & Cox.]

8. **Pain** or **altered sensation** may be experienced in exercise of any of the above functions, or may be irrespective of them, and may then be occasional or persistent.

B. Physical or Objective—Larynx, Fauces, Pharynx, and Nose:—

1. **Colour** may be
   - Increased (*Hyperæmia*).
   - Diminished (*Anæmia* or *Hypo-æmia*).
   - Altered.

   } Uniformly or partially.

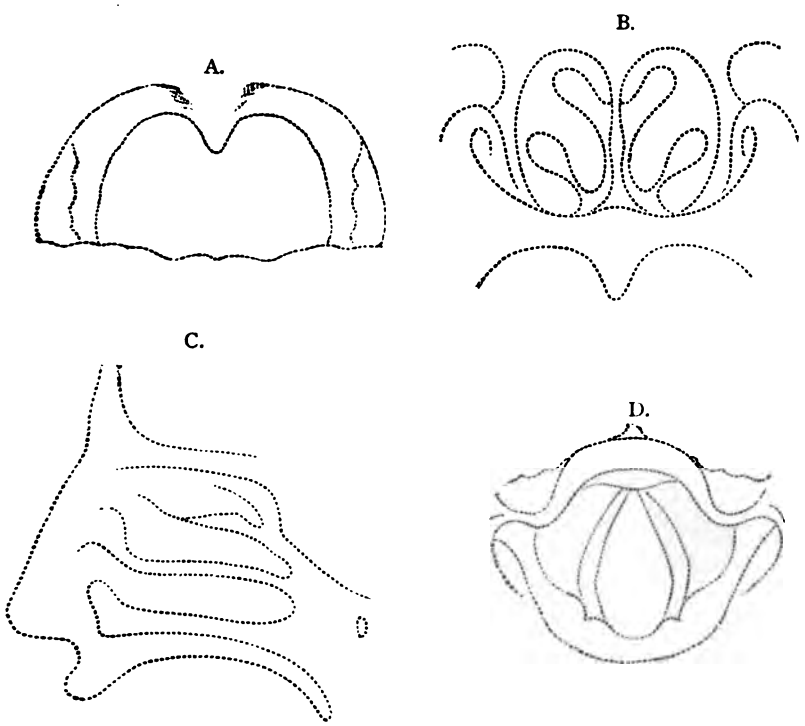


FIG. XC.—OUTLINES OF (A) FAUCES, (B) POSTERIOR NARES, (C) SECTION OF NARES, AND (D) LARYNX, FOR NOTE-TAKING.

2. **Form, texture, and mobility** may be altered by
   - Swelling—Œdematous infiltration—Thickening—Submucous deposit. Bony and cartilaginous hypertrophy.
   - Loss of tissue—Ulceration.
   - Cicatricial narrowing.
   - Compression.
   - Paralysis, bi- or uni-lateral.
   - New formations.

3. **Position** (relative) may be altered by disease.
   - Intrinsic.
   - Extrinsic.

4. **Secretion** may be
   - Excessive.
   - Deficient.
   - Arrested.

   Altered in colour, consistence, and odour.

C. MISCELLANEOUS :—

External :—

General
- Circulation.
- Temperature.
- Respiration.
- Lymphatic glands.
- Digestion.
- Nutrition.

etc., etc.

Commemorative
- Individual and family history of previous attacks, heredity, etc.

A. FUNCTIONAL OR SUBJECTIVE SYMPTOMS.

1. The voice may be natural in speaking, and modified only in singing, the upper or lower notes being lost, but the ordinary speaking voice unaffected; or difficulty may be experienced in passing from or to one or other register of the singing voice. The power of sustaining either the singing or speaking voice may be diminished, the vocal organ becoming more or less quickly fatigued. [It is often well to test the voice by the piano, marking on what notes, or in what register the voice fails.] The voice may be continuously hoarse, or may be uncertain, *i.e.* sometimes natural or only slightly husky, at other times passing involuntarily into falsetto or deep bass. It may be muffled or veiled. It may be unusually shrill and jerky. It may be strained and difficult. It may be lost in speaking; though in involuntary vocal acts, such as coughing and laughing, it may be phonetic; and, lastly, it may be entirely lost, and constitute the condition known as aphonia.

[In *The Nomenclature of Diseases*, drawn up by the Royal College of Physicians, 'Aphonia' is entered as a disease; and, unfortunately, this error has been perpetuated, not only in some systematic treatises on medicine, but even in special works on affections of the throat.]

In pharyngeal and naso-pharyngeal affections, the phonetic quality of the voice will, not necessarily, be impaired, though, articulation being interfered with, it will often sound thick or muffled, or it will be quite altered in tone, acquiring a nasal character. In this case it will be deficient in nasal *resonance*, or affected by a nasal '*twang*.'

Speech may be painful; it may be defective in the pronunciation of only certain consonants, as the palatal or guttural, the labial or the nasal; and it is of course important to determine whether such defects of speech or articulation depend on central or peripheral nerve changes, or on mechanical obstruction to proper muscular movements, or to some of the cavities of resonance.

2. **Respiration** may be altered in various ways. There may be mechanical obstruction in the nose, throat, or larynx, interfering with the free entrance of air, and leading to stridor and respiratory distress; or, again, a paralytic affection of the vocal cords may render impossible the free opening of the glottis which accompanies normal inspiration. The existence of such symptoms necessarily demands a careful investigation, with a view to determine the exact nature and situation of their cause.

Independently of these causes of impaired respiration, the breathing may be deeper or shallower than the normal. So many affections of the voice are the result of imperfections in the respiratory act, that a careful examination as to the mode in which the patient fills his chest, and of his vital capacity as ascertained by the spirometer, will often afford a valuable indication for diagnosis. Briefly, the general defects under this head are as follows:—(1) Imperfect chest expansion, the act being confined to lateral expansion of the ribs with limitation in the movement of the diaphragm, free descent of which is necessary for full deep breathing. (2) Exaggerated expansion by elevation of the clavicles and scapulæ. (3) Imperfect control of the expiratory act, the air being emitted either before the vocal cords are made ready to vibrate, or in undue amount for the performance of the vocal act.

3. **Cough.**—This may amount to slight irritable hacking or 'hemming,' or it may have all the characters of true cough. Its phonetic quality may vary: thus it may be hoarse, barking, metallic, stridulous, or aphonic. It may be accompanied by pain, may occur only on rising in the morning, on exertion, on lying down, after meals, on change of temperature, or after walking; or it may be frequent and continuous. It may be short, sharp, and paroxysmal, or suffocative; and, lastly, it may occasion retching and even vomiting.

Stoerck, in a pamphlet published in Vienna in 1878, has drawn attention to the fact that there are certain 'cough-spots,' namely, the inter-arytenoid fold, the posterior wall of the larynx and trachea, the under surface of the vocal cords, and the bifurcation of the trachea. He does not consider accumulation of mucus in the smaller bronchi causative of cough. It is only when the mucus or some other cause of irritation reaches one of the points above mentioned that cough is produced. Careful examination of these suggestions has convinced me of the accuracy of Stoerck's observations; and it need hardly be said that they are of the highest diagnostic importance.

The **Sputum** may vary considerably in quantity within the limits of health. When the larynx only is affected, the cough, unless there be ulceration, is accompanied by but little secretion, the mucus being expelled in small gelatinous pellets, more or less discoloured by impurities from the atmosphere. Expectoration may be either free and mucous, as in chronic congestion; muco-purulent after acute inflammation; purulent, as in the bursting of abscesses; frothy, as in phthisis and carcinoma; scant and glairy,

as in stenosis and asthma; and accompanied by blood in some cases, in which there is loss of tissue.

Hæmoptysis rarely occurs except when the lungs are affected, in phthisis, or in cancer of the larynx or pharynx. Streaks of blood are occasionally observed in the expectoration accompanying some minor diseases of both pharynx and larynx. A sensation to taste, and sometimes the actual presence of blood in the mouth on rising from sleep, is characteristic of varix of the tongue and mouth, of the pharynx, and possibly of the œsophagus—the last a condition to which attention has recently been drawn by Zeuker, Rokitansky, and others. I have also known it occur in connection with undue vascularity of the inferior turbinated bone without epistaxis.

In malignant disease, and whenever there is caries or necrosis, the expectoration will be of fœtid odour, and may contain blood pigment.

In laryngorrhœa, and in blenorrhœa, a disease described at some length by Stoerck, the secretion is excessive.

4. **Deglutition.**—This may be painful (*odynphagia*), difficult (*dysphagia*), or impossible (*aphagia*).

In considering the exact significance of this symptom, it is necessary to find out in which part of the act of deglutition difficulty or pain occurs—whether (1) in propulsion of the bolus past the anterior pillars, as in acute quinsy; (2) in the closure of the naso-pharyngeal space, and elevation of the root of the tongue, which act sends the morsel into the middle of the pharynx, a form of dysphagia seen after diphtheria and in syphilis; (3) in the passage of the food from the pharynx into the œsophagus, as in tuberculosis; or (4) in the œsophagus itself, as in stricture of that region.

Dysphagia may be due to a paresis of the constrictors of the pharynx, as occurs in patients with defective teeth, this condition leading to the repeated deglutition of imperfectly masticated food; to obstruction by inflammation or abscesses of the passages of the fauces, pharynx, or œsophagus; or to nervo-muscular disorders; or, again, to thickening and ulceration of the velum, pharynx, or epiglottis, in which case the food either returns through the nares or passes into the larynx. Extraneous causes are—mediastinal tumours, aneurisms, enlarged bronchial glands, and carcinomatous or syphilitic deposits in the sheath of the œsophagus; with these may be included the effects of injuries and corrosive poisons. Occasionally, dysphagia is caused by ulceration or new formations in the neighbourhood of the inter-

arytenoid folds, or by the pressure of an extrinsic tumour, as of an enlarged thyroid gland. Dysphagia may be modified according to the nature of the food taken, whether solid or fluid, warm or cold, piquant or bland; it may be paroxysmal and spasmodic, or continuous and persistent.

Odynphagia is characteristic, not only of tonsillar difficulty, but also of tuberculous or malignant ulceration of the epiglottis. On the other hand, in syphilitic ulceration and thickening, pain in swallowing is neither a prominent nor even a usual symptom; and in lupus, a disease of the throat which is by no means so rare as has been generally supposed, absence of pain is even more marked than in syphilis, and serves to differentiate this disease from tubercle.

Aphagia rarely occurs, except in very advanced stages of pharyngo-laryngeal disease, or as the result of malignant obstruction of some portion of the swallowing tract. *Cough* following deglutition may imply the passage of food into the larynx, whilst its regurgitation into the nares may be an indication of a fistulous communication between the trachea and gullet.

5. **Nasal Respiration** is often obstructed in certain pharyngeal diseases, and also by the presence of new growths, and hypertrophies in the naso-pharyngeal and nasal cavities. No examination of the throat is complete without careful inspection of the nasal passages through both the anterior and posterior nares, and also where symptoms point to disease of the naso-pharynx, without investigation of this region by means of the index finger introduced upwards behind the velum: these are points still much neglected both in precept and practice. Impediment to freedom of nasal respiration is easily ascertained by directing the patient to inhale and exhale by each nostril, the opposite one and the mouth being firmly closed. The difference is easily calculated by the sensation conveyed to the hand of the observer, if held near to the nostril of the patient as he breathes in and out. It may often be effectively demonstrated by the ease or difficulty with which the patient is able to blow out a lighted match, by one or other nostril. The distinction between the volume and note, in the case of diminution of normal calibre, by hypertrophy on the one hand, or a polypus on the other, is very marked, and, although difficult to describe, is, after a little practice, not difficult of discernment. These differences can be graphically demonstrated by sand figures.

In certain pharyngeal diseases there is a disagreeable odour

in the ex-spired breath, and it is important to ascertain the point of origin of the stench. In many instances, neither ocular nor digital examination will suffice, and the observer's olfactory sense must be called to assist. If the patient, firmly closing his nostrils, forcibly exhales, and the ex-spired breath is offensive, the cause is situated either in the larynx or œsophagus, pharynx or tonsils, or it may be caused by decaying teeth, or by gastric derangement. If, on the other hand, with the mouth firmly closed, nasal ex-spiration gives a foul odour, the disease is in the nasal cavity itself. By closing first one and then the other nostril, the surgeon may still further localise the seat of the disease. Another most valuable diagnostic point is whether the patient is conscious of the offensiveness of his breath. If so, the cause is an obstruction from the presence of polypus, or other growth. If not, the disease is of the secreting surface. By washing out the nostril with some disinfecting solution, as Sanitas, Condy's fluid, or boracic acid solution, it is not difficult to determine whether this foul odour be due to morbid alteration or retention and consequent putrefaction of mucous secretion, or whether it be the result of necrosis or caries. In the latter case the stench is seldom entirely removed, and is of a much more penetrating character.

6. **The sense of smell** may be impaired from any of the causes likely to impede nasal respiration, from disorder of mucous secretion, and from many diseases extending from the pharynx to the naso-pharynx. In the case of loss of this sense due to nasal polypus, the growth is to be looked for in the superior passages. I have referred elsewhere to two cases of complete anosmia, each cured by removal of an elongated uvula.

The sense of taste is generally disordered where that of smell is impaired. It will be probably limited, in the class of diseases treated in these pages, to inability to distinguish the flavour of food and bouquet of wine—that is, to so much of the sense as is dependent on the olfactory nerve; impressions on the palate due to the temperature and piquancy of food being unchanged.

7. **Hearing** may be impaired by various throat affections, of which may be named—enlarged tonsils, by their interference with the action of the palate or its muscles; by thickening of the pharyngeal orifice of the tubes, by disease of mucous secretion of the naso-pharynx, or by extension of any catarrhal inflammation from this region to the middle ear. To be thoroughly acquainted with the study of throat diseases, it is necessary to acquire facility

in examining the auditory apparatus, and to be able to recognise the importance of at least the more common variations in the appearances of the drumhead, the value of tests by watch and tuning-fork, how to pass a Eustachian catheter, and to use a Politzer air-bag. It is difficult to comprehend how an aurist can work satisfactorily without having studied the physiology and pathology of the throat and nose, or how one who occupies himself with diseases in the latter region can fail sometimes to be at a loss, unless he has worked also at aural surgery. It would be beyond the scope of this work to make it exhaustive of all aural diseases in relation to the throat; but I have appended a chapter suggestive of their study.

8. **Pain** is an important element of diagnosis, which will be considered when dealing in detail with the various diseases in which it occurs. Almost all reflex nervous pains and sensations may be traced to objective sources, and should not be treated, as is too frequently the case, as entities. Amongst the commonest disturbances of ordinary sensation are dryness, the presence of a foreign body in the throat, a hair, particles of sand, or a lump; or a feeling of heat, tingling, weight, or nausea. All these may be associated with fatigue in the performance of functional acts, which may also occur independently.

B. PHYSICAL SIGNS OR OBJECTIVE SYMPTOMS.

Those deviations from the normal condition which are revealed to the observer by reflected light will be more especially considered under this heading.

1. **Colour** of the parts may be increased, diminished, or altered. It may be increased or hyperæmic in acute, subacute, or chronic inflammation; it will be diminished or anæmic in general anæmia, and in certain toxic affections; changed to a bluish tinge in cyanosis; yellowish or greenish in jaundice; grey as in the earlier stages of phthisis, and altered in œdematous, purulent, and tuberculous infiltration. The colour of new formations varies of course with their pathological nature, ranging from white or pale grey to deep red or purple.

The change of colour may be general or partial; thus, one vocal cord may be congested, the other normal; the epiglottis may be congested, and the arytenoids healthy, or *vice versâ*. The colour may be altered in patches, as in the congestion of the vocal cords in secondary syphilis. The colour varies also according to the nature of the ulceration. It must not be

forgotten that the cartilaginous part of the vocal cords, especially in the case of those who constantly use the voice, is often slightly pink in colour, and this appearance must not be mistaken for the result of disease.

2. **Form.**—The calibre of the glottis is seldom increased, as, even if there is loss of tissue by ulceration, there is generally attendant thickening. The calibre may be diminished by all causes tending to infiltration—serous, purulent, tuberculous, syphilitic, or malignant; by new formations, and by paralysis of one or more intrinsic muscles. As a result of this last cause, the **mobility** of the vocal cords, *i.e.* their power of lateral approximation and separation, may be restricted, or their tension may be impaired on one or both sides. Such paralysis may arise from pressure directly on the nerve-supply, from central or peripheral disease, from interstitial disease of muscles, or from mechanical causes.

Impairment of movement of the epiglottis is due to mechanical causes, to relaxation of the glosso-epiglottic ligaments, or, it may be, to disease of the superior laryngeal nerve. The **texture** or surface-appearance will be changed under the varying conditions of the inflammatory process above alluded to.

3. **Position.**—Certain portions of the larynx may be displaced, —a condition which might be considered by some as constituting only an alteration in form,—or the whole organ may be pushed more or less out of position. Partial displacement is generally due to intrinsic disease, especially syphilitic, while displacement of the entire larynx is the result of disease in the neighbouring structures, as cancer, abscess, bronchocele, and other glandular affections.

4. **Secretion** may be excessive, defective, or altered in quality.

The character of the secretion of the salivary and other glands is an important element of diagnosis, and is to be considered independently of the question of the nature of sputa.

C. MISCELLANEOUS AND COMMEMORATIVE SYMPTOMS.

Into these it is unnecessary to enter at any length. The state of the tongue, the pulse, the temperature, the appetite and nutrition, the action of the liver, kidneys, and uterus, are all of as much importance in laryngeal disease as in any other. This point is one to be remembered, as in many cases the special method of examination seems to tell us so much that we feel inclined to make a diagnosis of the malady without asking a

question of the patient. On the other hand, it will not unfrequently occur that only by such general examination can a cause be found for a disease believed by the patient to be purely local, and in such a case the laryngoscope will be of value in a negative, but none the less practical sense.

As regards the use of the laryngeal probe, so far from being, as some authors insist, an instrument of the first importance, it is, in my judgment, one that it is very rarely necessary to employ. Nearly everything that is necessary to be known can be ascertained by visual inspection. The probe is, however, of service to the surgeon who, not being very familiar with the introduction of instruments into the larynx, would wish to learn before operating the exact direction that his instrument should take for the accurate cauterisation of ulcers or the removal of new growths. It is also of the greatest value, and indeed indispensable, in determining the precise nature of many intra-nasal diseases.

In external examinations it is important to examine the glands in the suboccipital region for corroboration of syphilis, and those in the parotid and submaxillary region for evidence of suspected malignant or strumous disease. Much may be learned by external examination of the larynx itself. There may be redness and swelling, as in perichondrial disease. It may be seen to be pushed out of the median line; or, as in the cases of cancer and syphilitic infiltration, its mobility may be felt to be impaired. There may also be an expansion of the larynx either symmetrical or unilateral. **Stethoscopic examination** will also be necessary to ascertain the condition of the lungs in cases of chronic laryngitis, or wherever there seems reason to suspect the presence of tubercle. Such examinations should be carefully repeated from time to time. The general utility of auscultation of the larynx or trachea is doubtful, though it is certainly of some diagnostic value in some affections of the œsophagus.

Careful examination of the heart and large vessels, and of the mediastinum for intra-thoracic growths, is all-important where there is the least interference with mobility or co-ordinate action of the vocal cords. The **sphygmograph** and **ophthalmoscope** also frequently aid the observer in a most important degree to the obtaining of an accurate diagnosis. An interesting example of the indication afforded by the **pulse** may be seen in its depression almost even to obliteration which takes place during the act of inspiration in cases of laryngeal obstruction, such as croup.

The **history** of the patient, both personal and family, is of

primary importance, and is equally indispensable for the purposes of diagnosis, prognosis, and sound treatment.

Information of high value, both in diagnosis and in prognosis, is to be obtained from observations, at regular intervals, of the **weight** of the patient, as, for instance, in distinguishing between syphilis and cancer, and in cases of chronic laryngitis, with premonitory signs of phthisis. It is equally essential, in such circumstances, to ascertain whether there are any nocturnal exacerbations of **temperature**. As already indicated, there is a certain class of cases where, when positive symptoms are absent, the **spirometer** is of use as indicating deficiency, and possibly, under treatment, increase of lung capacity.

The table on the opposite page, taken from *Voice, Song, and Speech*, will be found of service, as affording data for comparison on this and other desirable details of information.

TABLE SHOWING THE AVERAGE HEIGHT, WEIGHT, BREATHING CAPACITY, AND CHEST-GIRTH OF ADULT MALES AND FEMALES IN ENGLAND.

DRAWN UP FOR THE AUTHORS OF *VOICE, SONG, AND SPEECH*, BY CHARLES ROBERTS, ESQ., F.R.C.S.,

FROM DATA COLLECTED BY THE ANTHROPOMETRIC COMMITTEE OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

MALES.				FEMALES.		
Chest-Girth, after Expiration.[1]	Weight, including Clothes.[2]	Breathing Capacity[3]	Height, without Shoes.	Breathing Capacity.[3]	Weight, including Clothes.[2]	Chest-Girth below Breasts.
Inches.	Lb.	Cubic inches.	Inches.	Cubic inches.	Lb.	Inches.
38.9	165.6	290	72	238	141.1	32.7
38.4	163.3	280	71	230	139.1	32.2
37.8	161.0	270	70	221	137.2	31.7
37.3	158.7	260	69	213	135.2	31.2
36.7	156.4	250	68	204	133.3	30.8
36.2	154.1	240	67	196	131.3	30.4
35.7	151.8	230	66	187	129.4	30.0
35.1	149.5	220	65	179	127.4	29.5
34.6	147.2	210	64	170	125.4	29.0
34.0	144.9	200	63	162	123.5	28.5
33.5	142.6	190	62	153	121.5	28.1
33.0	140.3	180	61	145	119.6	27.6
32.4	138.0	170	60	136	117.6	27.2
31.9	135.7	160	59	128	115.6	26.6
31.3	133.4	150	58	119	113.7	26.1

[1] Military measurement: Tape round chest at nipples, arms hanging loosely by the side. Let the patient count from one to ten, then read off the measurement.

[2] The average weight of indoor clothes, including the shoes, is, for the

professional class	8 lb.
Average for working-class	10 lb.
Average for men	9 lb.

The average weight of a woman's dress has not been accurately ascertained, but it is among female shop-assistants and school teachers about 7 lbs. We are very much in want of information as to the weight of ladies' dresses; the average is probably nearly equal to, or even in excess of, that of the male working-class.

[3] Breathing capacity of males: Hutchinson's table, published in 1846, gives a difference of only 8 cubic inches for each inch of height. The above table gives a difference of 10 inches for each inch of height, and a relative increase of upwards of 20 cubic inches as compared with Hutchinson. These differences are very probably the result of the accuracy of the instruments now employed.

Breathing capacity of females gives in this table an average decrease of power, as compared with males, of only 20 per cent., instead of 33 per cent., as estimated by Hutchinson. Thus, having made allowance for the relative increase granted by us for men, a female at 66 inches, who would have breathed 142 cubic inches according to the old table, is now found to have a vital capacity of 187 cubic inches.

CHAPTER IX

THERAPEUTICS OF THROAT DISEASES: MEDICAL, SURGICAL, DIETETIC, AND HYGIENIC.

IN considering the therapeutics of throat diseases, special attention will necessarily be given to those remedies and methods of treatment which have a topical action; but it must not be supposed on this account that general treatment is unnecessary in diseases of the throat; on the contrary, each year's experience the more convinces me that it is often equally futile to treat throat diseases by only topical, as it is by only general means, and with this view many formulæ for suitable constitutional remedies are appended.

Lengthened reference to general methods of treatment is omitted, therefore, not because such treatment is considered unimportant, but because, on the principle that sound general medical and surgical knowledge should precede a study of the special branches of practice, it is to be presumed that most readers of these pages will be acquainted with the principles of constitutional therapeutics.

General treatment is always specially indicated when the throat affection is symptomatic of any general malady—scrofula, phthisis, or syphilis, for example—or when it occurs in the course of a continued fever, of one of the exanthemata, of diphtheria, or as a result of zymotic influences. In other cases, also, a constitutional diathesis must be combated concurrently with the local trouble.

In very many local manifestations, however, general treatment is, if not contra-indicated, at least unnecessary, and in the majority of cases of chronic laryngitis and pharyngitis the influence of local treatment will be markedly beneficial without the administration of any general remedies whatever.

In pursuing local treatment, it is necessary to consider the effect of remedies on the vascular supply, on the mucous and salivary secretion, on loss of tissue, on nervo-muscular action, and on the arrest of development or the eradication of new formations. It is,

therefore, exceedingly difficult to separate medical from surgical therapeutics, and both will be considered under one chapter.

In employing topical remedies, it is always well to bear in mind the physiological functions of the part to which the remedy is to be applied. For instance, the function of the larynx being to afford passage to air and not to liquids, the use of sprays to this part—at any rate, in any form except that in which the atomisation is so fine as to constitute rather a cloud than a shower—is in my opinion a mistake; vapour inhalations are much more suitable and more in accordance with the natural function of the organ. The same may be said of the indiscriminate practice of blowing powders into the larynx, and of the administration of snuffs in all and every form of nasal disease. They are for the most part unphysiological, and but too often are distinctly deleterious. On a similar principle, whenever applications of a liquid character are absolutely necessary, only a very small quantity of the liquid should be applied at a time (otherwise spasm of the glottis will be caused), and the area of application should be as far as possible limited to the exact portion affected.

Topical measures are of various classes. There are some which may be employed by the patient himself, as, for example, gargles, lozenges, and inhalations. The use of sprays and pigments, though often also possible to the patient, is more likely to be effective if accuracy of application is secured by the hands of the practitioner. And necessarily all intra-laryngeal surgical measures, and, indeed, every proceeding demanding exact medication of the interior of the larynx, can only be effected by one who has by practice acquired the necessary dexterity.

Gargles.—With respect to the value of gargles considerable difference of opinion exists, and it is an undecided point as to how far the gargle penetrates. There can, however, be little doubt that this depends to a considerable extent on the skill of the patient, and the amount of practice which he has had. It would appear, from the experiments and demonstrations of M. Guinier and others, that by practice, gargles may be allowed to enter the larynx itself, and to come in contact with the vocal cords. This act is called by Guinier laryngeal gargling, and the following is briefly the method of use: A comparatively small amount of fluid is taken into the mouth, which is to remain a little open. The patient should then protrude the lower jaw, so as to draw away the epiglottis from the laryngeal vestibule; and on half uttering a vowel sound the liquid drops into the larynx, and provided the patient can prevent himself from taking an

inspiration, those parts above the level of the vocal cords will be thus thoroughly laved. Experience compels me to say that laryngeal gargling is by no means an easy process.

It is probable that in the ordinary way gargles seldom, if ever, go behind the anterior pillars of the fauces. By the method of Von Troeltsch they may be made, however, to come in close contact not only with the parts touched in the ordinary mode of gargling, but also with the posterior wall, and even the vault of the pharynx and the Eustachian tubes. By this method, contraction of the pharynx takes place, and powerful displacement of superficial parts; mucous is forced out of the glands, and any adherent viscid secretion is rubbed off. Von Troeltsch very justly extols the remedial gymnastic value of systematic practice of this kind in insufficiency of the muscles of the Eustachian tube (levator and tensor palati) in cases of hypertrophy of the mucous membrane. The directions for the pursuit of Von Troeltsch's method are: 'Sit, or rather lie down, with the head thrown back; take a mouthful of the gargle, and make the movements of swallowing without letting the liquid go down the throat.' I have usually modified these to the extent of ordering the patient to close the nostrils by the thumb and finger during the process. But, in any case, the act is not an easy one for the layman.

Gargles are also of some value as mouth washes, even if their field of action be as restricted, as is generally the case; and inasmuch as some patients are able to extend that action, their utility will in such cases be proportionately increased. Gargles are generally contra-indicated when there is actual faucial pain, since more discomfort is liable to be caused by the irregular muscular acts exercised in their employment than relief experienced from the specific influence of their ingredients; this remark more especially applying to the ordinary method of gargling.

The conclusion which my experience forces on me is that the sphere of action of gargles is very limited, and that in diseased conditions, accompanied by pain, they are even harmful. Further, every one of the benefits usually placed to the credit of gargling can be obtained—and that, too, without any abundant disadvantages—by the use of a proper syringe, and this is the measure now recommended by me in practice. The nozzle of the instrument employed (Fig. XCI.) is introduced behind the last molar tooth. For children, in whom the use of gargles is usually quite impossible, the syringe is as applicable as it is for adults. It

should always be employed in patients suffering from diphtheria, in whom the effort of gargling—indeed, the mere rising from the horizontal position—might be attended with serious consequences.

Gargles are used for their antiseptic, astringent, sedative, and stimulant properties. Formulæ of gargles, of a strength suitable also to mouth washes, and having these respective actions, will be found in the Appendix. These formulæ are generally identical with those contained in the *Central Throat Hospital Pharmacopœia*, in the preparation of which I have joined with my colleagues. The list in the Appendix is limited to such novelties as have been tested by experience, but it contains almost all which have been found of distinct value in our conjoint practice.

Germane to the consideration of gargles and mouth washes, it may be remarked that ice as a local application is of great

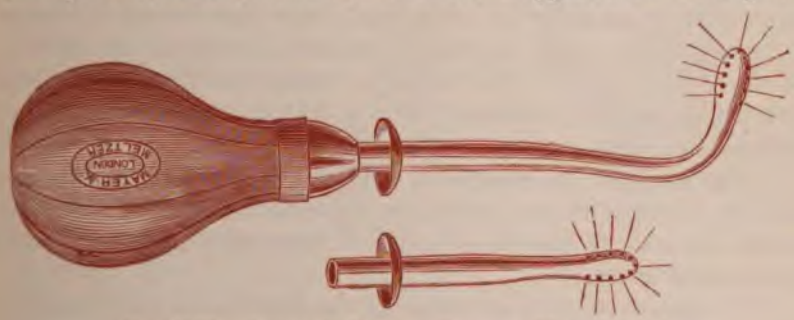


FIG. XCI.—AUTHOR'S THROAT SYRINGE (HALF SCALE).

value, not only as an anæsthetic before operation, but as a remedial agent in pharyngeal disease, tonsillitis, etc., and in the sore throat of scarlatina and diphtheria. For adults nothing is more agreeable than fragments of simple block ice, but the remedy is somewhat difficult to administer to children, who, suffering from pain in swallowing, are unwilling to exercise the function of deglutition. In these cases, it will be found of great service to ice the food. A simple mixture of egg and milk, uncooked, sweetened, and iced, is taken with avidity, and is serviceable both as a nutriment and as a remedy. Simple and cheap refrigerators are now easily obtained.

Lozenges.—The lozenge is a convenient form for the administration of many remedies. It should be remembered that by the use of lozenges we get not only the immediate local effect, but also the constitutional action of the drug; and this is often greater in proportion than if a corresponding amount of the

remedy had been taken direct into the stomach. As examples of this may be adduced guaiacum, a comparatively small amount of which, given in the form of a lozenge, will produce constitutional symptoms; also the effervescent liver lozenges of Cooper, each containing half a grain of calomel, one of which, taken at night, produces far more effect on bile secretion than would two or three grains of the remedy if taken in the form of a pill. Likewise, in the case of secondary syphilitic manifestations in the throat, the active ingredients of a suitable mercurial pill may be administered in the form of an effervescing lozenge, by which means a much quicker and more certain constitutional action is attained, and with considerable added benefit to the local condition. The very powerful effects produced by sedative lozenges, which contain but very moderate doses of their respective anodyne ingredients, are also well known. By the use of lozenges the salivary secretion is stimulated; this fact should be borne in mind when giving astringent lozenges, which often tend to increase the dryness of the throat, so characteristic of pharyngeal relaxation, unless combined with a sialagogue, as chlorate of potassium (Form. 12, 14, and 15).

The majority of lozenges, as commonly prepared, are unsuitable for cases of throat disease, in consequence of their hardness, which necessarily means slowness of solution and more or less mechanical irritation.

To obviate these inconveniences, the ingredients of all lozenges, when these remedies were first re-introduced to the profession by Morell-Mackenzie, were incorporated with fruit-paste, which not only renders them more palatable, but facilitates their solution. Considerable gastric derangement may, however, ensue, especially in the case of children, from this form of lozenge, and to cover this objection I have for some years past largely utilised liquorice as a vehicle, which is at once demulcent and pleasant. It has, moreover, the further advantage of masking the nauseous tastes of many drugs valuable to administer in this form. The extreme saline pungency of chloride of ammonium, for example, is almost entirely removed when given in combination with liquorice. To these may be added glyco-gelatine and marshmallow paste, each of which forms a very grateful lozenge basis.

Inhalations.—A valuable and effective method of applying remedial agents to the throat and larynx is by means of inhalations. Like most other valuable forms of treatment, however, it has been carried too far, and applied without due regard to the proportions of anticipated benefit and risk. Inhalations

may be subdivided into vapours,—aqueous or volatile,—atomised fluids, and fumigations.

Vapour Inhalations.—These are either moist or dry, and the moist have been further subdivided into *hot*, when the temperature of the moist air ranges between 130° and 150° Fahr.; and *cold*, when the temperature of the moist air is from 60° to 100° Fahr. Dry inhalations can be taken cold, but they are generally hot; that is to say, heat is applied to vaporise certain volatile matters, the fumes of which are inhaled. Volatile ingredients may also be used with the oro-nasal inhaler, which will be presently described.

For the administration of steam inhalations a suitable apparatus will be convenient. Various forms of inhaler have been devised, all more or less complicated in their nature, and all possessing, according to their designers, peculiar advantages. That devised by myself, and originally made for me by Messrs. Corbyn, and known as Corbyn's improved double-valve inhaler (Fig. XCII.), will, I believe, be found both simple and efficacious. The hospital inhaler of Martindale is an excellent and cheap instrument, and that of Ellis (sold by Arnold) is also good. The inhalers of Messrs. Maw's manufacture are great improvements on those formerly constructed. The cheapest (efficient) inhaler with which I am acquainted is that devised by Mr. Murch, lately dispenser of the Central Throat and Ear Hospital, and merits description (Fig. XCIII.). It consists of an ordinary quart glass pickle-bottle, closed by a cork bung perforated for tubes, as shown in the illustration. To obviate the necessity for a thermometer, the label is so placed that, by pouring cold water up to the level of its *lower* border, and then adding boiling water to that of its *upper* border, a temperature of 140° to 150° Fahr. is attained. The cost of this apparatus is one shilling.

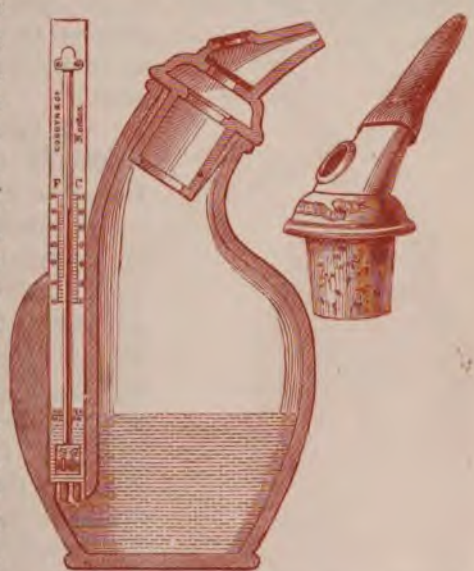


FIG. XCII.—SECTIONAL VIEW OF CORBYN'S DOUBLE-VALVE INHALER, AS SUGGESTED BY THE AUTHOR.

With regard to the method of using the inhaler, the following are the printed directions which I give to my patients with their prescription:—

'**For Ordinary Use.**—The medicament being added to a pint of hot water at the prescribed temperature, the vapour should be *inhaled* by means of full but not exaggerated inspirations, and should then be gently *exhaled* through the nostrils; in this manner six to eight inhalations may be taken each minute.'

[If our object be to treat only the oral cavity, the palate, the pharynx, or the surface of the epiglottis, the patient must be directed to take shallow respirations—avoiding deep ones as much as possible.]

FIG. XCIII.—THE 'MURCH' HOSPITAL INHALER.

'**In cases of Obstruction of the Passages from the Throat to the Ear,** it is sometimes desirable that the vapour should be forced towards the latter organ. For this purpose an ample mouthful of the steam should be taken, the mouth should then be shut, the nostrils compressed by thumb and finger of one hand, and the cheeks well expanded. This confined forcible expiration must be of only one or two seconds' duration, and must not be repeated oftener than once in a minute, the ordinary inhaling going on in the intervals: in other words, every sixth or eighth ordinary inhalation should be intermitted for one of those just described.'

[It is to be noted that this mode of inflating the Eustachian tube, known as that of Valsalva, is occasionally productive of giddiness. To obviate this tendency, I instruct patients to throw the head back during the inflation.]

'**For Nasal Inhalation** an india-rubber nasal-piece should be placed on the mouthpiece of the inhaler; or the orifice, if a jug or other vessel is used, should be narrowed by a cone of cardboard. Insert this nasal-piece into one nostril, the mouth and the other nostril being closed; after inhaling, gently exhale through the mouth.'

Steam vapour is often required in a room so that the patient may have the benefit of a hot and moist temperature without the

effort of inhaling. For this purpose the bronchitis kettle is brought into requisition, or better still, the steam draught inhaler in its present simplified form.

Dry, Hot Inhalations are of value in many cases of excessive catarrhal secretion. In a medicated form they are difficult of application, requiring expensive and complicated instruments; but it seems probable that, in a large number of instances, the Turkish bath derives much of its value, not only from its action on the sudatory glands, but also from the topical action of the hot, dry air upon the mucous membrane of the respiratory tract. It would be a good plan if in all Turkish baths tubes were arranged so that this air might be inhaled without the patient going into the hottest or 'radiating' room.

FIG. XCIV.—LEE'S STEAM DRAUGHT INHALER.

The reason why certain persons declare themselves unable to endure Turkish baths is, in all probability, simply because they fail to observe a few simple precautions, which it may be well to repeat for the guidance of intending bathers:—(1) Never to bathe at a less interval than two hours after a meal. (2) To put a wet towel on the head on entering the bath, so as to prevent heat-stroke, a fruitful source of palpitation, fainting, etc. (3) To have the body lightly shampooed, and to take a glass of water if perspiration be not active. (4) To always have the head washed as well as the body. (5) Not to take a cold plunge or swimming bath after, but to have a douche—at first warm and gradually cooled down—a warm douche being applied to the feet at the same time as the cold, or *immediately after*. (6) To take sufficient time to cool before dressing, and during the cooling process to keep the whole body and feet covered with a wrap. (7) Not to take a bath oftener than twice a week in winter, and once in

summer. If attention be paid to these simple precepts, there are few people to whom the Turkish bath will not be at once pleasant and beneficial.

Cold Inhalations.—Having met with many instances in which the use of steam inhalations by persons unable to remain within doors was attended by liability to take cold, I have gradually narrowed their field of application, and for some years I made careful experiments with, by way of a substitute, cold inhalations of the vapour of chloride of ammonium, produced by the mixed fumes of ammonia and hydrochloric acid. I regret to say that their use has been attended with considerable disappointment, a result which is abundantly confirmed by hospital colleagues and many other fellow-workers. The difficulty of keeping the vapour absolutely free from noxious excess of either acid or alkali is a serious drawback, so that when the inhalation is active its effects are irritating; when the vapour is neutral it is but too often inert. In any case its usefulness is probably best exemplified as a medium for eucalyptol, pinol, etc. Formulæ for these are appended (Form. 39, etc.).

The introduction of the **Oro-Nasal Inhaler**, for which we are primarily indebted to Dr. Coghill of Ventnor, and for strong advocacy to Sir William Roberts, Dr. Burney Yeo, and others, has also been of the greatest service, as by its means vapours can be employed without the risks indicated when thrown off with aqueous steam. The practical value of all these forms of inhalations is generally admitted, and but little heed need be taken of laboratory experiments tending to minimise their effect with a view of enforcing the merits of special inhaling chambers. Simple **inhalations of cold air** have been extolled by Professor Oertel of Munich, in the treatment of hyperæmic conditions of the respiratory organs, more especially of the larynx and of the lungs, brought about by increased activity or over-strain of these organs, as in public speakers, singers, etc. In these cases inhalations of cold air exercise a cooling and refreshing influence on the heated parts, and not only withdraw the heat by exciting the vessels to energetic contraction and diminishing the blood contents, but also avert the exudation and tumefaction of the affected organs which the hyperæmia may produce. The secondary inflammatory conditions and disturbances of nutrition gradually set up in these persons by oft-repeated injurious influences will thus be most effectually warded off, and the development of diseases, such as chronic laryngeal and bronchial catarrhs, relaxation of the vocal cords, etc., which may be regarded as professional

diseases, may be long delayed. Non-medicated cold air inhalations are also of use in local erythematous and inflammatory conditions attended with symptoms of heat, dryness, and smarting, such as erythematous and acute catarrhal inflammation of the nasal mucous membrane, and of that of the oral and pharyngeal cavities. They also bring subjective relief to the patient in parenchymatous and phlegmonous inflammations of the tonsils, of the peritonsillar tissue, of the uvula, and of the mucosa and submucosa of the buccal and faucial region generally. Also in the deeper regions, such as the larynx, trachea, etc., the cold inhalation acts beneficially, partly by reason of its low temperature, and partly by its slight capacity for moisture.

The apparatus for cold air inhalations consists essentially of a coiled tube, through which the air is inspired, fixed into a suitable receptacle, and around which pounded ice is packed. The air which passes through the tube prior to inhalation is thus reduced in temperature; but it is evident that the exact degree of cold must be very difficult to control even approximately.

Compressed Air.—The practice of the inspiration of compressed air, and—what is very like it in its effect—the breathing *into* compressed air, has been advocated principally for the treatment of pulmonary affections, attended by imperfect expansion of the lung-substance. Very brilliant results are claimed by Oertel for this procedure. On the Continent, pneumatic chambers have been brought into use, in which, by means of suitable apparatus, the atmospheric pressure is varied at the discretion of the medical adviser.

Atomised Fluid Inhalations.—The question of inhalations of atomised fluids has for many years received attention, notably by Hermann Beigel, and in the well-known book of Solis Cohen. More recently Oertel has treated the subject extensively. The time has gone by for doubting the fact that the pulverised fluid *may* pass a considerable way into the air-passages under favourable circumstances, even to the finer bronchi, nor can there be any reason for contesting it. In oral, pharyngeal, and nasal affections, atomised inhalations are doubtless of value, but they are much less serviceable than is generally supposed in laryngeal affections when administered by the patient himself, for, as a rule, comparatively little of the spray enters the larynx. The moment it impinges on the laryngeal surface of the epiglottis, the vestibule of the larynx closes tightly against the intruder. The patient gives, all the time of inhaling, short, gaspy coughs, with intervals of more severe paroxysm whenever the spasmodic stricture is

momentarily relaxed. If a throat be examined after five minutes' use of an atomised inhalation, it will frequently be noticed to be in a state of really considerable hyperæmia. Nevertheless, much of the evil effect of sprays is due to the form of instrument, and also to the nature of the remedy employed; and there are, admittedly, many patients who can attain sufficient command to overcome these difficulties, and to whom remedies in this form and of suitable dilution are preferably indicated. In accordance with this opinion of the limited value of spray inhalations, the list of formulæ for this kind of remedy is not much extended beyond those suitable for pharyngeal affections.

A method by which pulverised liquids can be taken into the larynx and lungs without any fear of doing harm by mechanical irritation, is that in which the waters of Marlioz (Aix en Savoie), Vichy, etc., are administered, large rooms being charged with clouds of very finely atomised medicated waters.

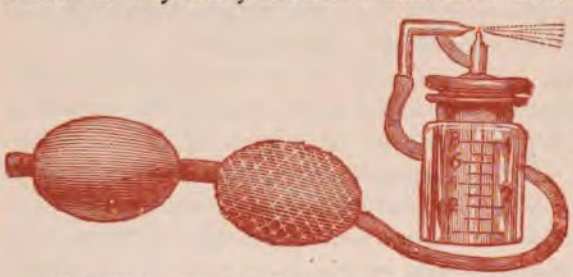


FIG. XCV.—DOUBLE HANDBALL THROAT SPRAY PRODUCER.

Sprays may be used, apart from purposes of inhalation, to produce a local effect on the mucous surfaces upon which they are directed, especially to the pharynx and nares, and by the admixture of various medicinal substances, may be made anodyne, astringent, antiseptic, resolvent, or solvent in their action. Pharyngeal and nasal sprays are frequently of service in diseases of the pharynx and naso-pharynx, especially where there is deposit of false membrane, as in diphtheria, or much inspissated mucus, as in ozæna, and in specific ulcerations, in which it is desirable to cleanse the surface prior to the application of more active remedial measures. In chronic pharyngitis also the continued contact of an astringent spray for some minutes is sometimes more efficacious than topical applications with the brush, and is certainly more suitable if the remedy is to be applied by the patient himself.

A very simple 'throat spray' is manufactured with the vulcanite spatula, which, being a part of the apparatus, acts well both in keeping the tongue down and in directing the stream of spray to the back of the fauces. Another form of this spray with

double handball, by which the stream can be made continuous, or can be broken, is that depicted in Fig. XCV. This is the form used by myself when applying cocaine as a sedative to the nose or throat before operation. The single handball apparatus is sometimes preferable, because it is non-continuous; the spray

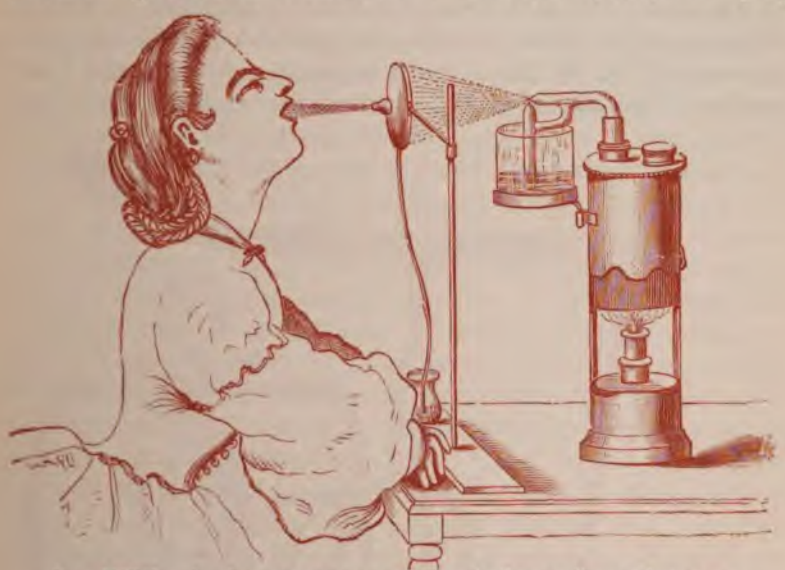


FIG. XCVI.—AN IMPROVEMENT OF SIEGLE'S STEAM SPRAY INHALER.

may thus be projected simultaneously with the act of inspiration, and arrested during ex-spiration; whereas, in Siegle's (Fig. XCVI.) and other continuous atomising apparatus, the spray, playing the whole time, may increase the irritation which has been alluded to as a not infrequent effect of such measures. In any case, for

FIG. XCVII.—LARYNGEAL SYRINGE.

By pressure of the finger on the india-rubber-covered receptacle on the handle, the amount of fluid to be drawn into the tube, or to be discharged, can be regulated.

home use steam-driven sprays are in most cases preferable, because the atomised vapour is somewhat warmed, which is often a desideratum. The best are those of Siegle, as improved by Krohne, and the universal atomiser of Codman and Shurtleff, of Boston, U.S.A.

When diphtheria has extended into the larynx and trachea, and for other diseases localised in those regions, applications of the character of a spray are better applied directly by the surgeon with one of Turck's or Schroetter's laryngeal syringes (Fig. XCVII.), a procedure which is, of course, not capable of self-adoption; and still better for direct application in the consulting-room, by those practising as specialists, is the compressed air pump (Fig. XCVIII.), with separate tubes for the various solutions. In place of the cumbersome and laborious pump

FIG. XCVIII.—PNEUMATIC PUMP AND SPRAY TUBE.

attached to the cylinder, it is recommended to employ the much more convenient pneumatic tyre inflator with foot-piece.

Oertel recommends the employment of iced water as a spray in hyperæmic conditions of the upper part of the respiratory organs, where the membranes are erythematous and dry, as in catarrhal and phlegmonous inflammations, either idiopathic or symptomatic; also in chronic catarrhs attended with heat and dryness, and in the so-called *pharyngitis sicca*, it is invaluable. Seitz has also used it extensively in the treatment of *angina*

tonsillaris. In cases where ropy secretion, difficult of expectoration, adheres to the mucous membrane, especially to the posterior pharyngeal wall, as in many forms of pharyngeal catarrh, a partial liquefaction of such masses may be at once effected by this means, and thus expectoration facilitated.

Sprays applied by pneumatic pressure, and by aid of the mirror, have long been employed in America in preference to topical applications by means of brushes, etc., on the ground that less irritation of the mucous membrane is thus produced. They have my unqualified approval for all cases where a free general distribution of a topical remedy is desired, and where the surface is unbroken, but for limited ulcerations and new growths I feel satisfied that better results may be obtained by means of solutions accurately applied to the diseased part by the cotton-wool brush, the action of the medicinal agent being thus localised. Moreover, stronger remedies may be used in this way than by means of the spray; for the stronger the agent we employ the more necessary it becomes to restrict its action to the diseased area, and this is difficult of achievement otherwise than by a brush or analogous instrument. The nozzle of all spray producers, whether worked by hand-ball or air-pump, should, if not a fixture to the supply tube, be secured thereto by a screw or good bayonet joint, in view of the not impossible accident of its becoming detached during use and being propelled into the windpipe or gullet of the patient.

The Uses of Inhalations.—The varieties of inhalations just described are employed for their action as antiseptics, antispasmodics, astringents, hæmostatics, resolvents, sedatives, and stimulants (capillary, mucous, and salivary). The best time for administering inhalations is, as a rule, before meals. The inhalation should not be taken rapidly; about six inspirations in a minute being quite sufficient. When the patient is using hot vapour inhalations, it will, of course, be necessary for him to take precautions against catching cold; and for this purpose it is advisable not to go out of doors within half an hour of taking such inhalation. As already noted, even with such precautions steam inhalations are not unattended by reactionary risks. In the case of cold inhalations, however, the patient may go out at once with impunity, and it will even be found, in some cases, that the use of a cold inhalation, just before going out, will procure for the patient an immunity from catarrh which he had not previously enjoyed.

In the administration of sedative inhalations very great care

must be exercised, some volatile sedatives, when mixed with steam, having a more powerful action than under other circumstances. For instance, as I many years ago pointed out, the inhalation of even one drop of chloroform in a pint of water at 150° Fahr. will occasionally produce giddiness and nausea. A similar caution applies to nitrate of amyl and aldehyde, which are best inhaled from a cone of blotting-paper, or by crushing a capsule containing the required dose into a loosely-folded handkerchief.

Fumigations, or Fuming Inhalations.—In this form the products of carboniferous combustion are inhaled. These inhalations are usually produced by the ignition of unsized paper, saturated with nitre or some other combustible substance. The dense fumes which thus arise are inhaled. The papers may be medicated with various stimulating and antispasmodic ingredients. The fumes may be inhaled from a saucer, or preferably from an old-fashioned cylindrical earthenware spill vase.

FIG. XCIX.—HAMILTON'S MERCURIAL FUMIGATOR AND ATOMISING INHALER.

In certain cases of tertiary syphilitic laryngitis and tracheitis, as well as on general principles in secondary syphilis, mercurial fumigations, administered by the method recommended by Mr. Henry Lee, or by means of an ingenious apparatus devised by my former colleague, Mr. Francis Hamilton (Fig. XCIX.), and manufactured for him by Messrs. Krohne & Co., will be most beneficial in effect on the local condition.

The illustration almost explains the instrument without further description. It is only to be noted that A is a lamp for subliming the calomel or other drug used, which is placed in a small drawer (B); the fumes pass into the sublimer (C), and make their exit with steam from the tube (D) connected with the water-boiler. The whole of the subliming apparatus can be removed, and a Siegle tube (K) substituted at D, the long limb being placed in a bottle containing the medicated solution, to rest on the drawer (B). The

apparatus then answers all the purposes of an atomising inhaler. The following are some of the precautions necessary in the administration of mercurial fumigations:—

First, the calomel should be the *resublimed* preparation, and not such as is ordinarily used internally in medicine. This is important, as the ordinary calomel is often very irritating for inhalation, owing to the impurities which it contains.

Secondly, the quantity of calomel used should at first only be small, about two to five grains; it can afterwards be increased to ten grains, if necessary.

Thirdly, the patient should be cautioned to never inhale more than he can stand without much coughing, and this is especially the case on first employment, when it is as well that he should not take more than two, three, or four inspirations; after a day or two, he will be able to tolerate a more free use of the remedy. In using the instrument, the second lamp (A) should not be lighted until the steam is coming off freely from the boiler, as otherwise a dry instead of a moist inhalation would be emitted, and this is as a rule far more irritating.

It will be seen at once that the apparatus can be used as a local fumigator for any part of the body, *e.g.* for an ulcer of the leg—as well as for the larynx.

External Applications to the throat are frequently of great value, and consist of compresses, poultices, pigments, etc.

The following are the printed directions given to my hospital patients for making a wet (laryngeal) compress:—

'Take a piece of linen the size of this piece of paper (ordinary note, 7 in. by 5 in.), or of lint *half* the size. In the case of linen, fold into *four*; or of lint, fold *twice*. Saturate the same with cold water (or very dilute iodine solution as prescribed, Form. 80A), and place it over the front of the throat, in the situation of the Adam's apple. Cover with a piece of oil silk, waxed paper, or other waterproof material, which must be at least half an inch larger than the lint in every direction. By lining a piece of flannel with the oiled silk, greater adaptability is obtained. Secure by means of a handkerchief, tied twice round the neck. A compress applied at night should not be changed until the morning, when the neck should be well sluiced with cold water, and rubbed with a towel.' Compresses are made in convenient form by Roberts of Bond Street. Those for the tonsils would naturally be required of a larger size, and the direction then is that the compress should be of dimensions to extend from angle to angle of the jaw, and are worn under the chin from ear to ear. A larger

size is required for the reduction of a goitre, for which iodine thus applied appears to be much more effective than when painted on in the full strength of the tincture.

Authorities differ as to whether the covering is to be impermeably water-tight or simply a dry cloth. My own experience is in favour of water-proof, with the precaution of douching with cold water and friction on removal of the compress. Cold moist applications thus employed are serviceable in

FIG. C.—LEITER'S PLIABLE METAL TEMPERATURE REGULATOR, FOR CONTINUOUS APPLICATION OF WARMTH OR COLD TO DIFFERENT PARTS OF THE HUMAN BODY.

Sp. The spiral regulator applied to the throat with the ingress tube (*ss*) in the supplying vessel, and the egress tube (*as*) going out of the drawing. *L.* Lamp for warming the water if hot applications are desired. *T.* Thermometer.

promoting resolution in recent congestions and inflammations of a subacute type; but for more active inflammations, or for the ripening of a suppuration, the older-fashioned cataplasm is preferably indicated. Of poultices the best forms are Lelievre's Iceland moss poultice, the ordinary linseed or linseed and mustard poultice, and spongio-piline.

I have, however, found that external applications of dry cold are generally preferable to heat in most cases of inflammatory disease of the throat. Either cold or heat can be applied

continuously by means of 'Leiter's temperature regulators' (Fig. C.), and a lengthened experience convinces me that we have in them very valuable agents.

There is, of course, nothing new in the application of cold for the reduction of inflammation, but hitherto the difficulties and inconvenience of applying either dry cold or heat with constancy of temperature in the region of the throat, or indeed elsewhere, have been so great that this method is still a novelty to many. The introduction of cold applications to the throat in preference to warm is also, I believe, a therapeutic innovation.

For those not familiar with the apparatus a brief description is requisite.

It consists of a simple leaden coil of narrow calibre, and made of flexible metal tubing, kept in position by pieces of webbing, and having connected at each terminal a flexible rubber conduit with leaden weights at the end, similar to that employed in the syphon nasal douche. By placing one terminal tube in a vessel of water, slightly above the patient's head, and making suction on the lower tube, syphon action is at once established; this lower or egress tube is placed in another jug acting as a receiving vessel on the floor. When the lower vessel is nearly full, the position of the two vessels may be reversed; and by this repeated changing, as required, a continuous flow of water through the coil is maintained for any length of time without even changing the water. For cold applications a temperature of 60° to 68° Fahr. is often sufficient to extract heat. That of 50° to 55° gives an effect equal to that of ice in icebags. If a temperature of 35° to 40° be employed, complete anæsthesia can be produced. Even the temperature of 50° cannot long be endured, and requires a layer of flannel between the coil and the applied surface. In case hot applications are required, an ingenious adaptation similar to that used for bath purposes, and known as the 'geyser,' will keep up the temperature to the degree required, which is indicated by a thermometer supplied with the apparatus.

This method of applying cold has been principally used by me in cases of tonsillitis, and in all the relief experienced was immediate and marked. It is now always the first step prescribed in the way of local measures. In a case of acute inflammation of the fauces, the result of inhalation of sewage gas, the effect was equally satisfactory. I have also employed it for the relief of pain and promotion of rapid healing after removal of tonsils, and in several cases of cancer of the throat. For this last condition, however, greater comfort and increased ease in deglutition are

generally derived from application of heat by the same method. Again, I have thus applied cold over an enlarged thyroid gland, with a result of perceptible diminution of the swelling, and I would recommend it in what one may call acute congestion of this region. This method was also advocated in my paper on the local treatment of diphtheria, before the International Congress in London (1881), but I had not at that time met with a case in which to test its efficacy. Later experience in several instances has more than confirmed my favourable anticipations. In inflammation of the larynx, of both mild and severe type, continuous cold is of marked value.

CASE I.—Very striking and indeed complete relief was afforded in a case of traumatic œdema of the larynx (due to the irritation of a piece of rabbit bone, accidentally swallowed), which I saw some two years ago in consultation with Mr. Hobson of Hemel Hempstead. In this instance painful and continuous spasm was at once relieved on application of the coil, but I was asked to pass the night in the house. A relapse occurred about 2 a.m., of such severity as to justify my being called from my bed, when it was discovered that the ingress tube was not in the water, and consequently the flow had ceased. On correction of this defect and renewal of the flow, the spasm was again immediately relieved, and did not return.

The advantages justly claimed for Leiter's regulators are pre-eminently manifested when applied to the neighbourhood of the air-passages, and they are as follows:—

1. The effect is strictly local.

2. The temperature is constant; when warm, applications do not become cold, nor cold applications warm.

3. Moisture, with all its attendant inconvenience, is not necessary, but if indicated can be applied by this method, the required temperature being maintained.

4. They are cleanly, light, and not liable to get out of order.

5. Ice, often so difficult to obtain, is not required, the temperature of ordinary pump-water being quite cold enough.

6. Lastly, it is not out of place to mention that the apparatus is so cheap, and capable, moreover, of such diverse application, that (unlike many other novelties in instrumental therapeutics) there need be no hesitation in urging its general adoption.

Of **pigments for external application,** the best for purposes of counter-irritation and absorption (the former now rarely employed by me) are the compound liniment of mustard, the liniment, ointment, or the tincture of iodine of the British Pharmacopœia: one coat of the latter may be applied every night with great advantage in chronic laryngitis, and the stain is generally gone before morning. The pigmentum chloralis et camphoræ (Form. 53) will also be found of great value as a

sedative in neuralgic affections, and in painful diseases of the cartilages or interior of the larynx. Strong counter-irritation by blistering of the throat on account of internal maladies has

FIG. CI.—THE ANTERIOR SYPHON NASAL DOUCHE. *a*. SOFT RUBBER NASAL PIECE, EMPLOYED BY AUTHOR FOR DOUCHE AND POLITZER BAG.

N.B.—The elbow, where the tube hangs over the tumbler, and the nasal piece are also made of glass, and offer similar advantages as in the case of the insufflator.

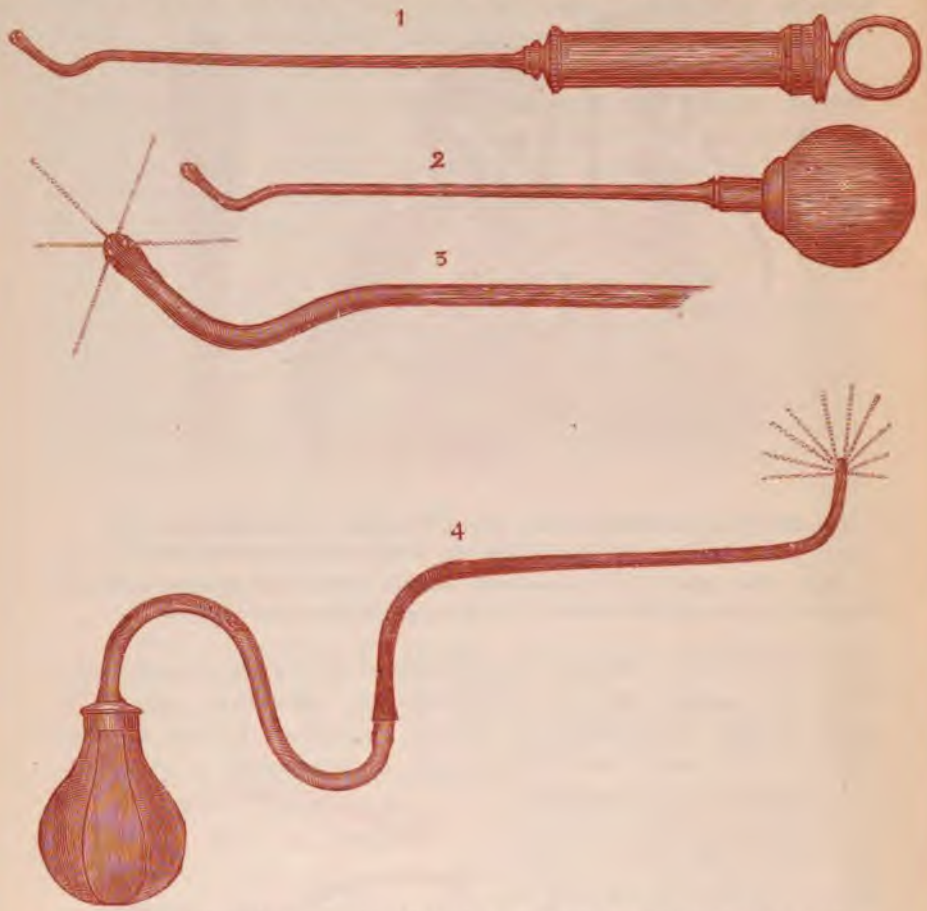
been found rather harmful than beneficial in my own experience. 'Mustard leaves' are not recommended. Moreover, many of them appear to contain an irritant ingredient foreign to the mustard-seed, which renders them very objectionable.

Douches or Collunaria.—A rough-and-ready, and consequently a not always satisfactory, method of washing the cavities of the throat and nose, besides gargling, is that of 'sniffing' fluid up the nostrils from the hollow of the hand or from a nasal bath; but special instrumental methods are by preference to be employed. These are the anterior nasal douche, the posterior nasal douche, Türck's laryngeal douche, already mentioned, and the œsophageal douche. The last-named is but little employed, and cannot be recommended, owing to the fact that any fluids

FIG. CII.—HARRISON ALLEN'S APPARATUS FOR ANTERIOR NASAL DOUCHE.

applied to the œsophagus are very quickly absorbed or washed away.

The action of the anterior nasal douche on the syphon



FIGS. CIII., CIV., CV., AND CVI.—POSTERIOR NASAL SYRINGES, AS USED BY THE AUTHOR.

Nos. 1 and 2. These forms are the best for a practitioner to employ. No. 3 shows the stream as it comes from the different points; Nos. 1 and 2 and 4 are drawn half dimensions; No. 3 is of full size. The instrument is made of vulcanite, and the exact curve of the tube can be altered at will by well oiling it and then heating it over a spirit-lamp. Recently some tubes have been made of virgin silver, which can be readily adapted to any curve or angle. No. 4 shows the same syringe more conveniently adapted for self-use.

principle (Fig. CI.) is based upon the fact that when breathing is carried on with the mouth open, the palate becomes approximated to the pharynx, and a current of fluid sent through

one nostril will issue from the other. Instead of the reservoir furnished with ordinary forms of douche, an excellent instrument was devised by the late Harrison Allen (Fig. CII.). This consists of a stopper to be adapted to an ordinary bottle, and so made, that when the bottle is inverted, the liquid will pass down the tube, while air enters through another smaller tube in such a way as to form no interruption to the flow of the fluid. On account of its cheapness and portability, as well as from the absence of force in the stream, this form of douche is one that may be safely recommended. The effect produced by the use of the anterior nasal douche, in any form, however, is not always very thorough, and in such circumstances the posterior nasal douche may be substituted. Besides the inefficacy of the anterior nasal douche, it is, in some cases, absolutely injurious. Dr. Roosa has brought overwhelming evidence in support of his statement that the anterior nasal douche, in a considerable number of cases, causes acute inflammation of the middle ear; and his experience has been amply confirmed by myself.

FIG. CVII.—THE 'LEFFERT'S' COARSE SPRAY (TWO-FIFTHS MEASUREMENT).

a. The vulcanite tube, containing the atomizing tube (*a'*).
b. The nasal piece, full size.

This objection does not seem, according to present experience, to obtain with respect to the use of the posterior nasal douche (Figs. CIII., CIV., CV., and CVI.), which is, besides, more effectual in clearing the post-nasal and nasal cavities of abnormal secretion.

Neither of these means is, however, always entirely efficient in removing nasal incrustations in chronic atrophic rhinitis (ozæna)

and the 'coarse nasal spray' of Leffert's (Fig. CVII.) is a valuable addition for this purpose to our therapeutic armamentarium. This apparatus is made in this country by Krohne and Co., who have, at my suggestion, graduated the bottle. The following are the printed directions, modified from Lefferts, which are pasted on the lid of each box containing the instrument:—

1. Dilute the medicated fluid with the prescribed proportion of hot water, so that the solution is about a temperature of 95° (blood-heat).

2. Stand erect, and incline the head very slightly forward over a toilet basin.

FIG. CVIII.—AUTHOR'S NASAL HAND SYRINGE (HALF MEASUREMENTS).

3. Introduce the conical nozzle of the apparatus into one nostril, and far enough to close it perfectly, holding the horizontal tube of the apparatus directly outwards from the face.

4. Open the mouth widely and breathe gently but quickly through it in a snoring manner; avoiding carefully all attempts at speaking, swallowing, or coughing.

5. Hold the end ball of the apparatus firmly in the right hand (the left holding the bottle), and *work it briskly* until the spray of medicated fluid, which should be felt at once to enter the nasal passage, has passed around it and appears at the opposite nostril. At the moment that the fluid passes into the upper part of the throat from the nostril which is being operated on, a desire to swallow will be experienced; resist it, and the next second the fluid passes forward.

6. Having used half the fluid, remove the apparatus, and repeat the operation upon the opposite nostril.

7. Before removing, allow the ball to collapse, so that *all* the air may be pressed out. On removal of the nozzle, blow the nose gently—*never vigorously*.

Should the nostrils not be entirely cleansed by these means, it is recommended that the patient use, a few minutes after, a warm saline douche of two ounces, by means of the anterior nasal syringe which I designed for the purpose (Fig. CVIII.), an instrument which can be easily represented by covering the glass nozzle of a Gilbertson two-ounce syringe with a soft rubber teat,

the hole of which has been enlarged. For some time past I have given directions that all terminals for introduction into the nostrils are to be made oval, the shape of the nostril, instead of round. This ensures more perfect introduction and less risk of distortion of the nasal orifice on long-continued use of the instrument.

Douches are generally used as antiseptic and deobstruent irrigations, and occasionally also as hæmostatics.

Tampons of wool, medicated with iodoform, hamamelis, and other drugs, and *bougies* made of gelato-glycerine (the Gossypia and Buginaria of the *Throat Hospital Pharmacopœia*), have not, on trial, justified their recommendation. Ointments and thickened fluid solutions, applied with wool-brushes of varying sizes, according to the amount of pressure and dilatation required, are found by my colleagues and myself to answer all purposes claimed for the newly introduced remedies under the above fanciful titles.

Pigments for Internal Application.—These can only be applied by the patients themselves to the pharynx and anterior—by some also to the posterior—nares. For application to the pharynx aqueous solutions are the best. If it be desired that the substance should remain long in contact with the part, it will be found well to mix it with bismuth and starch or mucilage, or to add a little glycerine. Undiluted preparations of glycerine are very irritating in all catarrhal conditions of mucous passages, owing to the peculiar attraction of glycerine for water. For applications to the nares, vaseline or lanoline will be found very useful media, these substances being absorbed by the nasal mucous membrane, while oils and cerates are not.

All pigments should be applied with some form of brush. It is, as a rule, much more difficult to apply solutions accurately with a sponge; though many excellent practitioners use this last material secured in a suitable holder, employing a fresh morsel for each case (Figs. CIX., CX., and CXI.). Sir Philip Smyly, instead of a brush of hair, uses pieces of aluminium suitably bent and fixed in a wooden handle; round the roughened ends of the metal he twists a piece of absorbent cotton-wool, using a fresh piece for each patient (Fig. CXII.). This material is very suitable for pharyngeal, and especially for nasal applications, and, both on æsthetic principles and as a precaution against the risk of contagion, is preferable for general use, whether in hospital or private practice, to a brush employed repeatedly and indiscriminately for several individuals. Having more than once witnessed the unfortunate accident of fracture of the aluminium at its juncture with the handle, I now employ only

whalebone or vulcanite wool-holders made in one piece; and to avoid the possible risk of the wool dropping off, the end is perforated, and the wool is threaded in the holders to be used for

FIG. CIX.

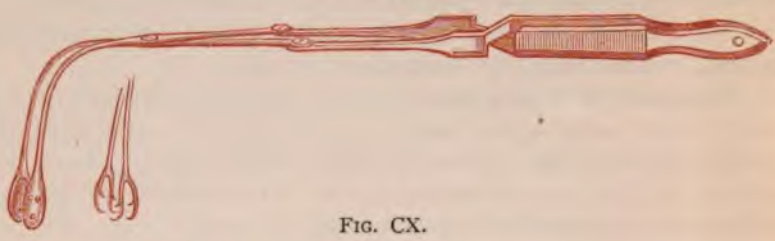
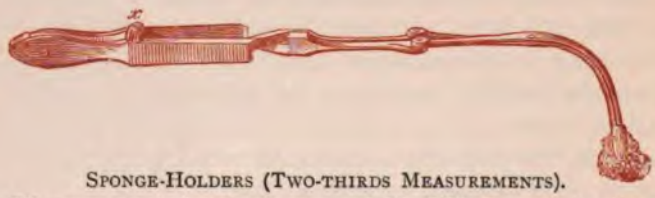


FIG. CX.

FIG. CXI.



SPONGE-HOLDERS (TWO-THIRDS MEASUREMENTS).

Fig. CX. represents the instrument open, and Fig. CXI. the same closed, by the catch (x) so as to secure the sponge.

laryngeal application, as shown in Fig. CXIV., in which are also illustrated the varying shapes of the wool. In the case of children, where the use of the brush, or of any instrument, is a

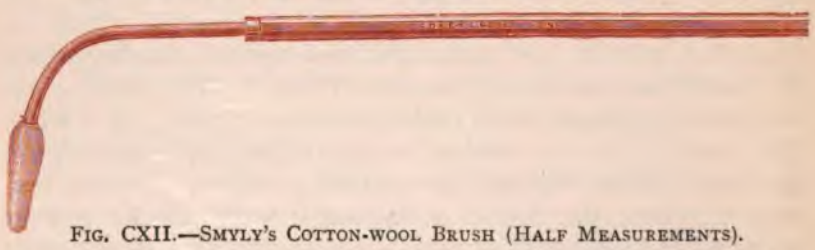


FIG. CXII.—SMYLY'S COTTON-WOOL BRUSH (HALF MEASUREMENTS).

matter of difficulty, it will be found a good plan to wrap a piece of lint round the index finger, as this can be often inserted when a brush or a sponge would not be tolerated.

Pigments may be used for their antiseptic, astringent, sedative, solvent, or stimulant action.

CLASS II. includes all intra-laryngeal operations, some of which have already received notice. These, in my own practice, are mostly confined to fluid applications with a brush, solid applications with a porte-caustique, insufflations, the galvano-cautery,

FIG. CXIII.—TERMINALS OF COTTON-WOOL BRUSHES (FULL SIZE).

1. Mode of threading cotton-wool into whalebone or vulcanite holder. 2. Square-ended cotton-wool brush. 3. The same pointed. 4. Post-nasal cotton-wool brush.

and the use of surgical instruments of various kinds. The direct topical application of laryngeal sprays, as advised by Lefferts and other American authors, would also come under this heading.

Whenever it is necessary to apply solutions low down into the larynx, care should be exercised not to overcharge the brushes.

FIG. CXIV.—LARYNGEAL BRUSH (TWO-FIFTHS MEASUREMENTS).

In the case of ulceration, or where a local sedative effect is desired to be prolonged, the fluid may be thickened, as already described.

With regard to the best form of instrument for making applications to the larynx, laryngologists differ in opinion, and each practitioner will doubtless suit his own fancy in this respect.

The shape of the brush employed, for the most part, in my own practice (Fig. CXIV.), is that of a curved right angle, less square than those usually recommended. The great fault of most brushes sold by instrument makers is that they are too large. Every brush for the larynx should be capable of being drawn to a fine point, like a water-colour painting brush. The size should be that known to artists' colourmen as 'goose-quill.' As just indicated, hair brushes are almost entirely superseded in my practice, both public and private, by those of absorbent cotton-wool, which can, of course, be made of any size or shape necessary to the requirements of individual cases.

Insufflations of powders may be conveniently administered by the instrument figured below (Fig. CXV.); but for more accurate application, and especially in laryngeal and œsophageal disease, the insufflator of Labiersky (Fig. CXVI.), sold by

FIG. CXV.—VULCANITE INSUFFLATOR FOR APPLYING MEDICATED POWDERS TO THE THROAT.

The portion of the tube (*a*) slips up and discloses a receptacle (*b*) for the powder. When charged, the telescope part (*a*) can be slid back. *N.B.*—This instrument is now made in glass, the transparency of which is convenient in case of obstruction; it is also more easily cleaned.

Krohne, is far preferable. Insufflations have been much in vogue of late years for nasal, pharyngeal, and laryngeal diseases. I have given them a fair trial, and find that—(1) In nasal diseases, taken as snuffs, they are as useless as the unphysiological ground on which they are recommended would lead the practitioner to expect; for if there be excess of thin rhinal secretion, it is by powders made thick; if the secretion be thick, it is made thicker. In any case the orifices of the glands are obstructed, and though the result may be less discharge, it is at the expense of increase of inflammation of the mucous membrane, and probably of incrustations leading to erosion and ulceration. (2) In the pharynx insufflations of iodoform and other remedies are sometimes serviceable in painful ulcerations, though they are not often used in my own practice. The only conditions in which I have found powders to be really of benefit are tuberculous thickening and ulceration of the epiglottis, and in malignant diseases. In these cases direct

applications by means of an insufflation of a medium of bismuth, starch, or tragacanth, containing morphine in varying proportions, are attended with the best results, and the remedy in this form can be better applied by the patient than can a liquid. The latter form is, however, on many accounts, preferable when the practitioner makes the application, as the remedy can be applied

FIG. CXVI.—LARYNGEAL INSUFFLATOR WITH VARIOUS TERMINALS.
The instrument is worked by pressure on the spring (*a*), the ball having been previously inflated.

with far greater accuracy. Powders may also be applied to the œsophagus with good results, and are probably the best form of topical remedy for that region. Laryngeal insufflations for congestion and the minor forms of disease situated below the epiglottis are not only unnecessary, but are often injurious rather than beneficial. They are, moreover, often administered quite inap-

FIG. CXVII.—SIMPLE CAUSTIC CARRIER FOR PHARYNX AND UPPER PORTION OF LARYNX, VIZ. AN ALUMINIUM ROD CHARGED WITH FUSED NITRATE OF SILVER (HALF MEASUREMENTS).

propriately, as, for instance, in one case which came under my notice, to give relief to the cough due to an aneurism of the aorta pressing on the left recurrent laryngeal nerve.

The most economical, convenient, and for general purposes safest caustic-holder (Fig. CXVII.) is a piece of curved aluminium rod—an old brush-handle may be conveniently used

—which is charged by simply dipping the point into fused nitrate of silver; a little of the silver salt can be kept in a porcelain crucible and melted by means of a spirit-lamp when it is required to recharge the aluminium points. For the application of chromic acid I employ copper wires with round or flat ends, on which the slightly deliquesced acid can readily be fused. For laryngeal use, to have guarded caustic-holders constructed on the principle of Lallemand's urethral cauterizer, is necessary. One of this description is shown in Fig. CXVIII. It is a modification devised by Dr. Jarvis, of New York, and is recommended by him for the especial purpose of making applications of fused chromic acid to laryngeal growths not easy of removal by snares. For this purpose I have myself usefully employed it, as well as for ordinary cauterizations. The instrument consists of a cannula containing a movable metallic rod, at the end of which is placed the caustic, and is continued in the form of a spiral spring at the curved portion of the tube. The spring, regulated by a set screw, on the principle of the tube forceps, serves as a buffer to deaden the force of the probe's impact against the growth. The handle of the applicator is hollow to receive the spring, which is set and relieved by a rack movement under the control of the operator.

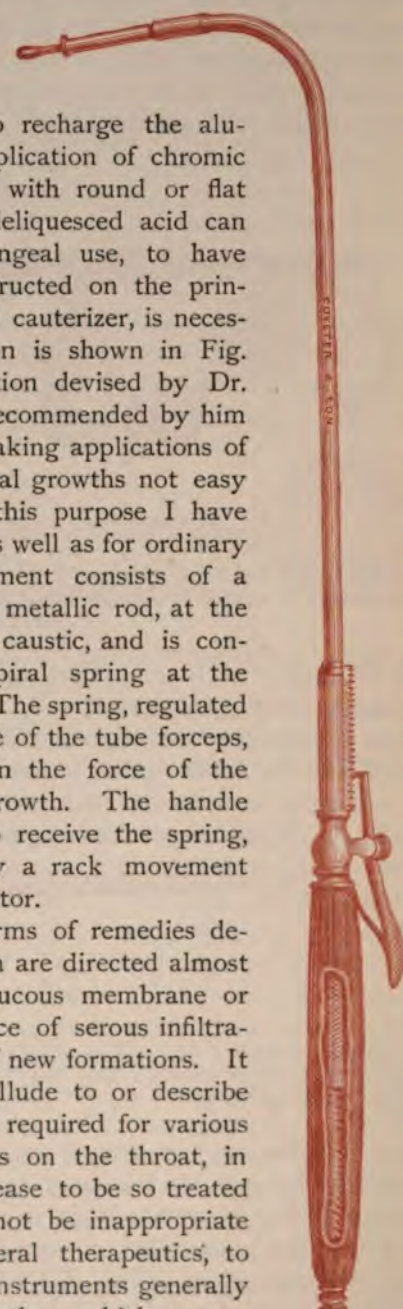


FIG. CXVIII.—JARVIS'S GUARDED LARYNGEAL PORTE-CAUSTIQUE.

Up to this point the forms of remedies described have been those which are directed almost entirely to diseases of the mucous membrane or submucous tissue, with absence of serous infiltration, and prior to the stage of new formations. It will be more convenient to allude to or describe those instruments which are required for various recognised surgical operations on the throat, in the places in which the disease to be so treated are considered; but it may not be inappropriate to our consideration of general therapeutics, to make mention here of some instruments generally surgical, and also of some others which appear

to me to be opposed to the principles I have promulgated for guidance in our treatment of throat affections.

Bleeding and Scarification by leeches or external cupping have never been employed by me, and are not advocated; nor do

FIG. CXIX.—LARYNGEAL LANCET (HALF MEASUREMENTS).

I think that punctures with the lancet of pharyngeal or faucial swellings, unless there is distinct evidence of the presence of pus, are attended by more than slight and temporary relief; but in the larynx, where œdematous swelling may occur to such an

FIG. CXX.—GIBB'S LARYNGEAL SNARE (HALF MEASUREMENTS).

The wire loop passed through two eyes at *a* travels along an open cannula tube, bridged at *b b*, and is secured at *c* to the movable crosspiece, traction on which diminishes the size of the loop. This cross bar may often be conveniently changed from the horizontal to the perpendicular position.

extent as to endanger life, scarification by means of the laryngeal lancet (Fig. CXIX.) will often be found necessary, and its use will be followed by noteworthy benefit. The unguarded laryngeal lancet is a very dangerous instrument.

With regard to instruments for removing growths from the larynx, my firm conviction, based on experience, is that those now most generally in use are far more dangerous than those formerly employed. At first, all instruments for the removal of growths were on the principle of a snare; gradually, however, we got tube forceps, guillotines, rigid loops with sharp edges, fenestrated knives, forceps (some of them strong enough to break a vesical calculus), scissors, knives, guarded and unguarded, and the galvano-cautery.

This work being intended mainly for the general practitioner,

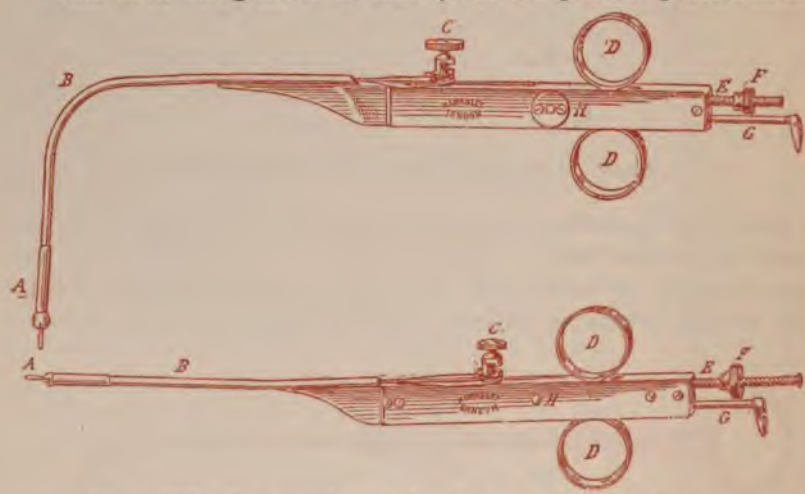


FIG. CXXI.—CARMALT JONES'S LARYNGEAL AND NASAL SNARE.

A is a movable cap, with two holes through which the wire of the snare passes. B, the tube guarding the wire, the ends of which are fixed to a screw-catch (C). E represents a bar continued through the body of the instrument; the catch (C) is fixed on to this bar, and runs in a slot in the top. F is a nut running on E; it regulates the size of the loop, and by increasing the leverage is useful when the part to be divided is very tough. G, a bar similar to E, but ending in a plate for pressure of the thumb of operator. H, a pinion; the bars (E and G) are racked and work against H. Pressure driving in G causes H to revolve, E to be drawn out, and consequently tension is made on the snare. The cap (A) allows of the snare being turned round in the axis of the distal part of the tube to any angle, and by pulling off the cap the snare is reset after use—all that is necessary is to shape it. The wire used is steel piano-wire.

and laryngeal growths being happily rare, it is not necessary to enter largely into the subject. It may, however, be stated as a general principle, with respect to laryngeal instruments, whether for growths or otherwise, that it is impossible for them to be too delicate, and that they should all be constructed on the axiom, '*Primum non nocere.*' I employ a laryngeal snare, on the principle of that devised by Gibb (Fig. CXX.), and find it a most valu-

able instrument for many small pedunculated growths; while the guarded instruments of Stoerk and Jellenfy are also constructed in accordance with the proposition just laid down. My lately deceased colleague, Mr. Carmalt Jones, devised an excellent instrument (Fig. CXXI.), which I have successfully employed in

FIG. CXXII.—VOLTOLINI'S LARYNGEAL SPONGE PROBANG (ONE-THIRD MEASUREMENTS).

several operations. Its principal feature of improvement consists in the instrument remaining fixed at the point at which it is placed while the wire noose is being drawn up. Another instrument of great value, and more generally employed by some of my colleagues than by myself, is the laryngeal sponge probang,

FIG. CXXIII.—MORELL MACKENZIE'S LARYNGEAL FORCEPS—LATERAL AND ANTERO-POSTERIOR.

first described in print by Voltolini (Fig. CXXII.), though the method had been pursued by my deceased friend Llewelyn Thomas some years previous to the publication of Voltolini's paper. One case in which it was used is mentioned in my first edition (1878). Tube forceps and rigid cutting-loops are sometimes useful, but neither are absolutely safe against the risk of

doing injury to healthy tissues. All unguarded forceps are dangerous, and can hold no necessary or justifiable position in the surgeon's laryngeal armament. In this opinion I have been supported by my colleagues at the Central London Throat and Ear Hospital during a period of over twenty years, and no laryngeal growth has ever been removed in that institution by an unguarded instrument. My colleague, Dundas Grant, has invented a guarded forceps (Fig. CXXIV.), which has all the virtues of the instrument of Mackenzie (Fig. CXXIII.) or Fauvel,

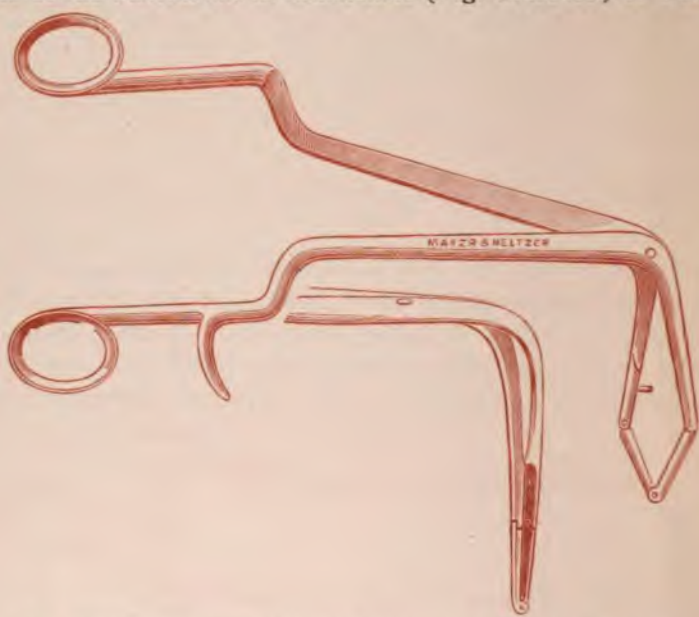


FIG. CXXIV.—DUNDAS GRANT'S GUARDED LARYNGEAL FORCEPS.

with an efficient guard against the possibility of injuring healthy parts.

Electro-Therapeutics.—The application of electricity to the pharynx, larynx, and œsophagus may be required for the following purposes, which practically embrace the range of its application in the diseases under our consideration—(1) Illumination; (2) cauterization; (3) electrolysis; (4) excitation of nerves and muscles.

The most serviceable arrangements will be as follows:—For the cautery as for illumination we employ a bichromate battery or an accumulator from which a powerful current can be obtained; whilst for nerve or muscular excitation and for electrolysis we should use a Leclanché battery.

Whatever may be the form of battery employed, a rheostat is necessary to regulate the intensity of the current. The Faradic current is especially valuable in many of the minor disorders of the throat and larynx. It has also been recommended to be applied to the Eustachian tube, and again to the membrana tympani. The best instrument for these purposes is that of Mackenzie (Fig. CXXV.), slightly varied according to the part to be treated. This apparatus consists of a necklet (*B*) in connection by a chain (*ch*) with one pole of the battery, the other being conducted to an electrode (*A*), so arranged that the current (*c*) does not pass from the point (*f*) until a small spring (*d*) in the handle is pressed upon by the finger. The advantage of this is that no current is passed into the larynx until the instrument is in the required position, *e.g.* in contact with the vocal cords. It is to be noted that in many cases application of the current percutaneously is sufficient without introduction of the electrode

FIG. CXXV.—LARYNGEAL ELECTRODE (ONE-THIRD MEASUREMENTS).

into the throat; nor is it by any means necessary in all circumstances even to attempt to enter the larynx—for a brisk current to lips, tongue, or fauces, if *accompanied by firm moral influence and encouragement* of the patient, will frequently restore a voice lost from simple functional causes. The constant current is limited in its application to diseases of the throat as a means for diagnosis, *e.g.* atrophy of muscle; and for securing electrolysis as a means of disintegration of a new growth, in addition to its utility for the purposes of cauterisation, as already explained.

Galvano-Cautery.—This application of electricity has proved highly useful in many cases of throat disease, especially those of a specific character, as well as in some affections of the nose and ear.

The apparatus (Fig. CXXVI.) which I am in the habit of using, and which was made for me in 1877 by Messrs. Mayer and Meltzer, consists of a battery of two cells charged with bichro-

mate of potassium solution, each cell having four zinc and carbon plates. This battery is very convenient in size, measuring only 12 inches in height by 9 inches square. Contact is made by

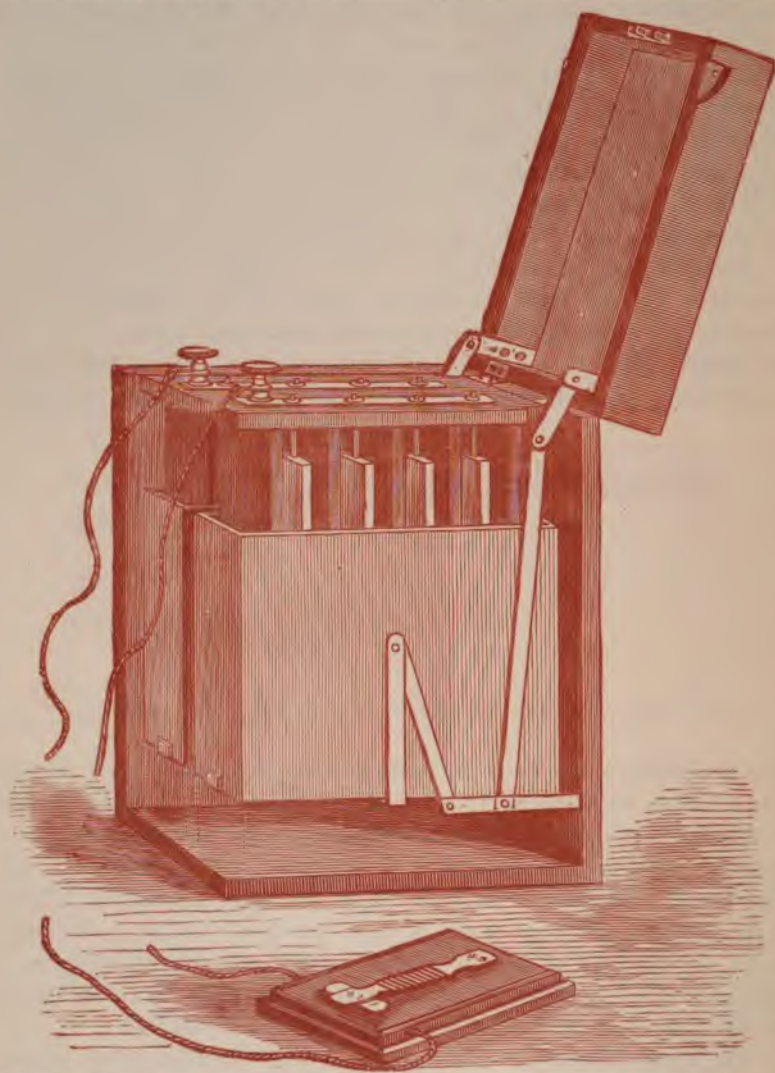


FIG. CXXVI.—AUTHOR'S GALVANO-CAUSTIC BATTERY, WITH FOOT-PIECE (MAYER).

The side of the battery is taken out to show the arrangement for bringing the plates in contact on lifting the lid.

the foot of the operator pressing on a key, both hands being thus left free, while at the same time the current is entirely under the

control of the operator himself. This battery is put into action by pushing back the lid of the case, and is out of action when the lid stands vertical or the case is closed.

I now employ alternatively the excellent battery supplied by the Electric Power Storage Company (Fig. CXXIX.). It can be had with from two to any number of cells, the price, which is moderate, being at the rate of about thirty shillings a cell. For private requirements two to four cells are ample, the current lasting without recharging for an average of three months with daily use. They are absolutely trustworthy, but cannot be employed without a regulating rheostat which Coxeter has fixed. Those who have electricity in their houses can easily recharge these batteries, as may be required.

In all my batteries the insulated conducting cords are for convenience twisted together, except at the ends where they branch off to be attached at the separate poles of the battery

FIG. CXXVII.—VARIOUS GALVANO-CAUSTIC LOOPS AND KNIVES.

and to the cautery handle; they are made light and flexible, a great desideratum to the operator. For those who have electricity 'laid on' in their houses, Schall has constructed a converter by which the interrupted current or one for cautery are ready to hand.

Papers, with cases treated, were read by me on this subject at the Manchester meeting of the British Medical Association (1877), and again at the International Medical Congress in London (1881); the following are the conclusions at which I have arrived:—

1. That the galvano-cautery is most useful, being more rapid and permanent and less painful (almost painless under cocaine) than mineral forms of caustic, in tertiary specific ulcerations of the

fauces and soft palate, especially in cases of perforating ulcer,

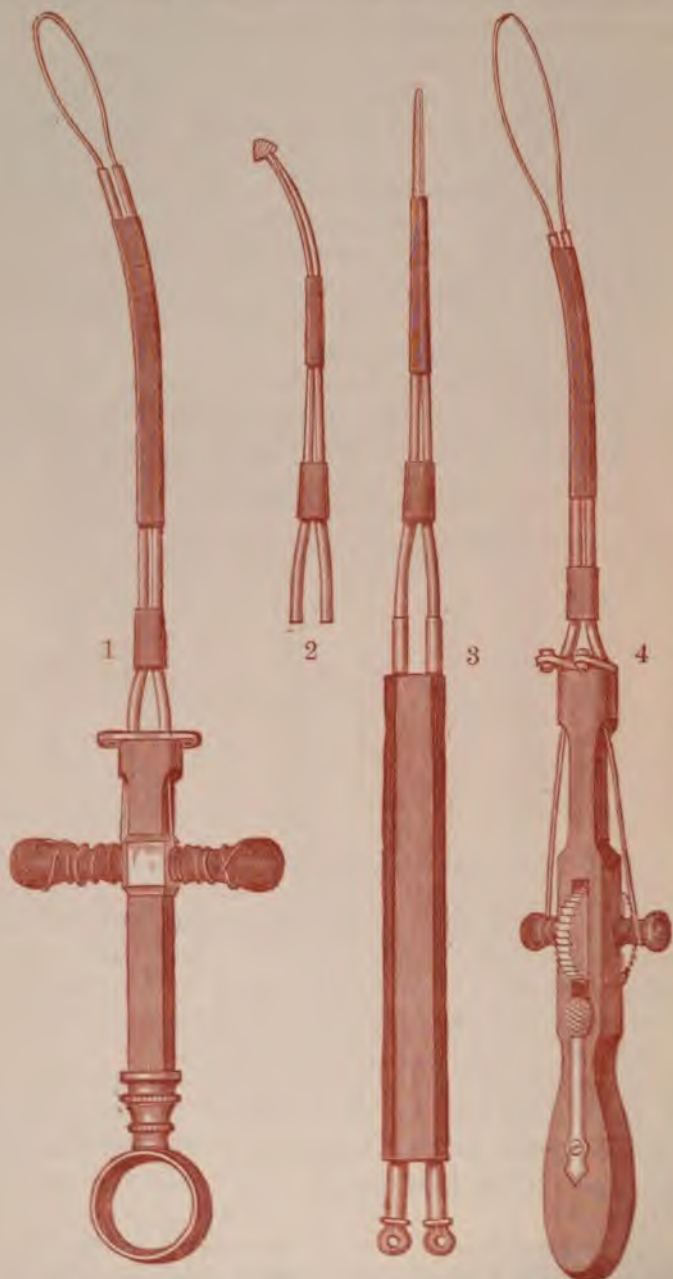


FIG. CXXVIII.—GALVANO-CAUSTIC LOOPS AND POINTS.

and when the disease is congenital or hereditary, or where there is a combined scrofulous diathesis; and also for destruction of varicose veins of the pharynx in chronic pharyngitis, and at the base of the tongue. It is for this and all other purposes in which the cautery is indicated far more convenient than any form of actual cautery, since it can be introduced along delicate cavities cold, and after cauterisation be withdrawn cool; moreover, its action is limited to the point touched.

FIG. CXXIX.—E. P. S. CAUTERY ACCUMULATOR WITH RHEOSTAT.
A, for graduating the strength of current.
B, new cautery handle with rack movement instead of screw, etc. for hot or cold snare, etc.

2. For removal of enlarged tonsils, the method is unnecessarily painful and tedious, and generally inefficient; but it surpasses any other for destruction of diseased lacunæ in unenlarged or in atrophied tonsils. It may also be advantageously employed for removal of the relaxed tissue of an elongated uvula.

3. That in diseases of the larynx, except where occurring in

the epiglottis, the cautery is only exceptionally admissible, since there is great danger of doing serious injury to healthy tissues.

4. That it is valuable in many cases of hypertrophy of tissue in the vault of the pharynx, though, when so employed, precautions are necessary to prevent extension of inflammation to the middle ear.

5. That it is almost invaluable as an escharotic and alterant in those cases of nasal and naso-pharyngeal disease in which the secretion is altered, whether the exchange be that of excessive flow with limpidity, or arrest and inspissation, the two representing not infrequently but different stages of one and the same pathological condition.

FIG. CXXX. — INSTRUMENT FOR SECURING A NASAL POLYPUS AT ITS BASE PRIOR TO PASSING THE WIRE LOOP AROUND IT (HALF MEASUREMENTS).

6. That nasal polypi, being first secured by suitable self-holding forceps (Fig. CXXX.), can be most completely removed by the cautery loop (Fig. CXXVIII. 1 and 4) with the minimum of pain and hæmorrhage, as well as without risk of injuring surrounding parts. Subsequent to this opinion given at Manchester—and as expressed in my later paper at the Congress —I now preferably remove the polypi with the ordinary cold wire snare or forceps (Figs. CXXI., CXXXI., CXXXII., CXXXIII., and CXXXIV.), and reserve the cautery for later applications with the intention of destroying the surface of the bases of origin.

7. That scrofulous ulcerations, diseased bone, and submucous thickenings or outgrowths in the same region can be treated with equal success, and better by the cautery loop than by the cold snare or forceps.

8. That after removal of aural polypi in the ordinary way, the cautery may usefully be applied with a fine-pointed instrument (Fig. CXXVIII., No. 3) to the base, in order to prevent recurrence.

CXXXI.

CXXXII.

CXXXIII.

CXXXIV.

FIGS. CXXXI., CXXXII., CXXXIII., AND CXXXIV.

Fig. CXXXI. Snare for nasal polypus.

Fig. CXXXII. Hamilton's ditto, acting either as slip noose, or by a screw movement as an écraseur.

Fig. CXXXIII. and CXXXIV. Forms of forceps for nasal polypus, each with catches to secure the grip when the instrument is closed. The latter is on the model of an invention of the late Mr. Lund, each blade consisting of a double cutting-ring.

9. That the cautery (with the same cautery point) may be useful, under certain precautions, in those cases in which it is desired to make a permanent perforation in the tympanic membrane.

10. That the risk of hæmorrhage from galvano-cautery applications can be averted by not using the cautery point at too great a heat, which should be regulated by means of a rheostat. A black heat often answers all that is required; a dull red heat is seldom needed, and by me never exceeded; a bright red heat is quite unnecessary, and anything like white heat is to be absolutely avoided as dangerous.

11. The after-pain of galvano-cautery is, in my experience, much less than that following use of a thermal cautery, acid nitrate of mercury, or caustic pastes of soda or potash, in which there is diffusion of the destructive agent beyond the part treated. In some regions—*e.g.* the nose—the after-pain is generally *nil*.

In operations on the nose and ear, it is necessary, or at least desirable, to have the passage guarded from the risk of being scorched by the heat of the wire. This is best promoted by making the blades of the nasal dilator of ivory. Great care is also necessary in intra-nasal applications of the galvano-cautery to avoid touching the septum as well as the opposite turbinal. Neglect of these precautions is the most frequent cause of the formation of troublesome synechiæ in the nasal passages.

Nevertheless, with all precautions as to modified heat of the cautère, non-conducting specula, etc., the accident of an inflammatory otitis may occur. After operations in regions likely to lead to such a contingency, as well as to avoid adhesions, I apply carbolised oil (5 per cent.) on wool to the cauterised surface, and in some cases atropine drops (20 per cent.) to the drumhead through the external meatus.

I agree with Shech that **Massage** of the throat gives but doubtful promise. Nevertheless, some advance has recently been made in this procedure, both in the throat and the nostrils. My own experience, however, is not sufficient to enable me to speak with authority on the subject.

The last instrument to be mentioned in this chapter is that for the detecting, catching, and withdrawal of foreign bodies from the œsophagus or pharynx. The one I prefer is that known as the 'Ramoneur,' with two modifications — (*a*) that the end (Fig. CXXXV. 1) is of ivory or metal, instead of sponge, for the

striking and consequently better detection of coins or other solid foreign body; and (*b*) the addition of two small pins. The first (2), working in a socket, prevents the expansion of the net during introduction; the second (3) enables the surgeon to keep the hair net spread when once drawn up. This arrangement allows him to have much greater delicacy of touch than is possible if he is obliged (as is the case in the instruments usually made) to be continually keeping tension on the piston. For carriage in the pocket I have had this instrument hinged at the centre. I am also in the habit of carrying œsophageal bougies of half-length, which can be screwed together for use. A long pair of forceps is the best instrument for withdrawal of foreign bodies from the larynx. Voltolini's sponge probang (Fig. CXXII.) is sometimes serviceable. If the foreign bodies are in the trachea, the windpipe had better be opened at once, This is a wise precautionary step to such an operation as splitting the thyroid cartilage, a measure sometimes necessary when a foreign body is fixed in the glottis.

FIG. CXXXV.—AUTHOR'S IMPROVED RAMONEUR FOR DETECTION, CATCHING, AND WITHDRAWAL OF FOREIGN BODIES FROM THE ŒSOPHAGUS (ONE-THIRD MEASUREMENTS).

Tracheotomy.—A question will often arise as to the relative merits of early and of late tracheotomy in chronic disease of the upper air passages, and, for that matter, the question whether the operation should or should not be performed at all; and it is one which has hitherto rather escaped the attention of writers. Notwithstanding that the laryngoscope has now been in use for nearly forty years, tracheotomy is still performed for the most part on indications—more or less accurate—of urgent dyspnœa, with, to say the least of it, insufficient attention to the physical nature of the obstruction, or to the possibility of relieving it by other than surgical means. As a general and preliminary basis for consideration, I would venture to announce certain postulates:

(*a*) Tracheotomy is indicated in chronic laryngeal disease (1) on account of urgent dyspnœa caused by an exacerbation of inflammation in the course of a chronic malady; and (2) in certain diseases in which our prognosis points to a progressive, though possibly gradual, increase of respiratory difficulty. In the latter case, the operation, if performed early—that is to say, as soon as continued dyspnœa becomes a prominent symptom—is more likely to be both immediately and remotely successful, than if delayed until resulting pulmonary changes have become pronounced.

(*b*) The degree of vital danger which exists in a case of laryngeal and tracheal obstruction depends mainly on the situation of the lesion.

(*c*) Supra-glottic obstruction rarely causes vital risk. For example, inflammation, acute or chronic, unaccompanied, be it premised, by true œdema, and leading to thickening, ulceration, and cicatrisation of the epiglottis, ary-epiglottic folds, or of the ventricular bands, is not often accompanied by urgent dyspnœa, and this is equally true, whether the case be one of tuberculosis, lupus, or syphilis. I have made an exception with regard to true œdema, not such as exists in phthisis, which is in no sense of that nature, because I am of opinion, with Sestier and Morell Mackenzie, that not only is œdema of the larynx much more rare than is generally supposed in Bright's disease—Mackenzie did not find it once in 200 cases—or in general anasarca, but also 'that the intervention of a phlegmasia of the pharynx and larynx, or neighbouring tissues, is nearly always necessary to its production.' I would go further, and express my belief that neither in the case of such an acute œdema, accompanied as it is by a general phlegmasia, usually the result of a septicæmia, nor in that of one occurring in the course of a chronic syphilitic laryngitis, and causing difficulty of breathing, is the œdema often limited to supra-glottic regions, but that that most dangerous of all situations, the portion immediately below the glottis, is almost invariably involved, and that this is proved, even where the cause is not visible, by the character of the dyspnœa.

An exception in some sense has also to be made to this proposition, in regard to cancer, in which the disease, although it be apparently situated at a spot not interfering with the glottic patency, may, by extension into the deeper tissues, produce an obstruction which is to all clinical intents and purposes of the nature of a neurosis—that is to say, it is due to a paralysis of intrinsic respiratory muscles.

(*d*) Obstruction of the lumen of the glottis itself—by which I mean of that space bounded by the vocal cords—may be considerable without producing vital dyspnœa. Examples of the truth of this statement are frequently afforded in the case of benign neoplasms, when attached by broad bases to the superior surface or free edge of the vocal cords. The circumstance of this absence of respiratory difficulty is indeed of high diagnostic import in regard to their benign character.

A similar immunity, though not so complete, is also observed in cases of congenital or cicatricial webs of the vocal cords where there is no implication of other contiguous structure.

(*e*) Sub-glottic obstruction, whatever the cause, is always attended with the gravest danger to life, and it can be further postulated that the lower the situation of the obstruction in the windpipe, the greater is the risk; and also the less is the chance of relief being afforded by an artificial opening.

(*f*) It is not unimportant to premise—though less so than it was twenty years ago—that no tracheotomy ought to be advised, much less performed, on account of chronic—it might indeed be said any—laryngeal disease without a thorough preliminary investigation with the laryngoscope; and further, that the same means of information should be practised before a tracheotomy tube is removed.

CASE II.—One of the first cases of tracheotomy in my independent hospital experience illustrated the necessity for enforcing this precaution, as well as the unwisdom of neglecting it. It occurred to me in 1874, in the person of a gentleman's servant, who had been tracheotomised by the house surgeon of a hospital boasting a special throat department, which was presided over by both a physician and surgeon. Not only was no laryngoscopic examination made prior to the opening of the windpipe—that might well have occurred—but the tube was removed after eleven weeks, and the patient discharged without such a step having been taken. The man came under my hands less than six months later, and was found to be the subject of serious stenosis, due to syphilis. It was urgently necessary to repeat the operation, and though I had the opportunity of seeing the patient for many years afterwards, I was never able to advise withdrawal of the tube.

As further illustrations, one has only to look through the morbid specimens in our various museums to see how many cases there were in pre-laryngoscopic days in which tracheotomy was unnecessarily performed, and, on the other hand, to recall as one—doubtless of many similar—the case under the care of Liston, quoted by Solis-Cohen, in which a stenosis, having been successfully dilated through the tracheotomy wound from below, the tube was withdrawn, but had to be reinserted on the following day.

It is fair, therefore, to make this postulate, that while the more

expert the laryngologist, both in diagnosis and therapeusis, the less frequent will be tracheotomy in his practice; so also the less liable will the patient be to suffer from either a too early withdrawal or a too prolonged retention of the tube.

I have no intention of entering into any detailed description of the operation, but would simply say that, except for cases of urgency, and in which the tube will not be required for more than a few days, I never perform or advise *laryngotomy*—that is, introduction of the tube through the crico-thyroid space. Such an operation is virtually never indicated in chronic disease, and seldom in acute maladies. Nor do I, if possible, ever make an opening that does not leave the first ring of the trachea undivided—for division of, or pressure of the cannula on the cricoid cartilage, is very likely indeed to be followed by caries of that structure and other complications. Such a limit in my practice represents the *high* operation, while by the *low* operation I mean one in which the trachea is opened below the inferior boundary of the third ring.

With regard to tubes, without doubt the rectangular tube of Durham carries the palm for all cases in which the instrument has to be worn for any length of time, and is also the best in the first instance where one has plenty of assistants. But though the old bi-valve tube of Fuller has been very uncompromisingly condemned of recent years, the ease with which it can be introduced—where hands to hold retractors and the assistance of dilators are not available—renders this instrument a very serviceable one to the country operator for first use in cases of emergency. Whatever tube is employed, I endeavour to leave it unchanged for forty-eight hours, and then insert the one which is to be retained for the whole length of time required.

Further remarks regarding other operative procedures on the larynx may be deferred till consideration of the treatment of the various diseases in which they are required.

Anæsthetics.—Of local methods **Cocaine** stands first, and to the use of this drug I have already alluded more than once. For operations on the pharynx and larynx I employ a spray, and find that anæsthesia is generally sufficiently pronounced to commence operating in from five to seven minutes. Sometimes, as in the case of lingual varix, or in hypertrophy of the lingual tonsil, the solution may require to be 'rubbed in'; this may be done by means of a brush. It should not be forgotten, especially in operations on the young, and, as I have specially observed, at all ages in those of a tuberculous tendency, that the amount

cocaine administered by a spray may be enough to produce serious toxic effects; and, indeed, at least one fatal case due to this cause has, to my knowledge, occurred. Wherever there is any reason to fear this result, **Eucaine,** though less active in its anæsthetic properties, should be substituted, or the risk may be diminished by using the two drugs in combination. For the relief of pain after operations, such as tonsillotomy and uvulotomy, I employ a soft lozenge containing a tenth of a grain of cocaine or eucaine.

For intra-nasal procedures I apply a solution of cocaine on pledgets of cotton-wool, which should be retained from ten to fifteen minutes; or in the case of eucaine somewhat longer, as its action is slower. It is often necessary to use a solution of a greater strength than ten per cent.; and occasionally for the more painful intra-nasal operations, such as those involving the use of the trephine or saw cautery, it may be well to add a little of the solid salt on the moistened wool, which is to be retained within the nostrils for about three minutes before commencing to operate.

For some external operations, such as removal of glands in the neighbourhood of the neck, hypodermic injection of cocaine is very efficient. Even for tracheotomy, five to ten minims of a ten per cent. solution, injected on each side of the immediate region at which the trachea is to be opened, will produce nearly complete insensibility of the skin. Ten to twelve minutes should be allowed to elapse before commencing an operation, and in the majority of instances pain will not be felt even from the first incision through the skin. Local anæsthesia can thus be maintained sufficiently long to allow of a careful and leisurely performance of the operation. Among the advantages of cocaine as a local anæsthetic in tracheotomy, it quiets the breathing and steadies the larynx in cases in which respiration is seriously hurried. It also has the effect of depriving the part of blood, and thereby diminishing hæmorrhage during the operation, whereas with chloroform and ether the contrary effect is often produced. But it is to be noted that as the constricting influence of the cocaine upon the capillaries passes off, these vessels become widely dilated—a condition very likely indeed to lead to fresh hæmorrhage. To avoid this result, and especially in intra-nasal operations, where in any case free bleeding may be anticipated, I am in the habit of dissolving the cocaine in a solution of hamamelis, the hæmostatic effect of which is more prolonged.

It is necessary to repeat the caution which I have already

published (*British Medical Journal*, April 27th and June 1st, 1889) against allowing patients to use cocaine indiscriminately for relief of quite slight symptoms of chronic conditions. This is a dangerous procedure, for the twofold reason—(1) That after long use the drug loses even its analgesic action, as is exemplified in the diminished relief it affords, after a time, to dysphagia occasioned by tuberculous or other ulceration—the most justifiable indication for its continuous employment. (2) While cocaine, in the first instance, promotes salivary and mucous secretion, it is found that patients who long indulge in applications of this drug suffer later from abnormal dryness of the throat. Further, its good effect in temporarily relieving capillary engorgements of the turbinated bodies, etc., results, if its use is unduly prolonged, in either an anæmia with atrophy, or a no less inconvenient increase in the intensity and chronicity of the hyperæmia. I have seen two cases in which I believe anosmia to have been induced or at least aggravated by this habit. Tetanic spasms have also been noticed as an effect of long use of this drug. Needless to add, that the amount of cocaine absorbed into the system has an injurious general effect on the health, in the shape of a debilitated vasomotor system; this is accompanied by aprosexia, loss of memory, want of decision, hypochondriasis, and depression of energy, spirits, and intellectual powers. The same caution applies to the habitual use of 'voice-lozenges' containing cocaine.

In reference to the use of **general anæsthetics,** in operations on the nose and throat, there is some difference of opinion. For more severe operative measures, where complete and prolonged anæsthesia is necessary, either chloroform or ether may be employed. The discussion of the respective merits of these two substances is outside the purpose of these pages, and I content myself with expressing my preference for chloroform.

In the minor operations, such as tonsillotomy and the removal of adenoids, a few authorities still object to any general anæsthetic, contending, not only that it is unnecessary, but that its attendant risks are considerable. My own position is in direct opposition to this practice. The operations now under consideration are often very painful, and are always terrifying, especially to young children. If the patient can without appreciable risk be saved from these unfortunate experiences, it seems to me to be the duty of the surgeon to at least give freedom of choice in the matter. Hence it is my practice to offer to the patient himself, or his guardians, the option of having the operation performed under an

anæsthetic, and this rule is adopted in hospital no less than in private practice. That such a rule may be pursued with safety—at least when **nitrous oxide** is the anæsthetic selected—is evident from the experience of our hospital, where the gas is given every year to some 1300 to 1500 patients; the period of anæsthesia may be prolonged by a combination with oxygen, and further by the subsequent inhalation of a small quantity of **ether**; these without a single fatal result, or indeed of an anxious moment.

But whilst I am a strong advocate of the use of nitrous oxide in such operations as tonsillotomy and the removal of adenoids, I am an equally energetic opponent of the administration of **chloroform** under such circumstances. One of the special risks of these operations is the entrance of blood into the larynx—a risk which is avoided in nitrous-oxide anæsthesia, because of the persistence of the cough reflex, a risk which remains in full force under chloroform, in consequence of the liability to abolition of this reflex, even under precautions to stop short of it. Chloroform has yet another special danger in those operations, arising from the fact that patients with obstruction of the naso-pharynx require, in order to produce anæsthesia, a smaller dose than those with a clear breath-way. Such patients are, as it were, in their ordinary condition, already advanced a stage towards asphyxia. Hence are explained those not infrequent cases in which, when chloroform has been used in naso-pharyngeal surgery, the patient has died before the operation has actually been commenced. It is impossible to immediately stop the advance of narcosis by removal of the mouth-piece when chloroform is being given, whereas with nitrous oxide such a measure is at once followed by a movement towards reanimation. These are the special claims advanced for nitrous oxide, as a general anæsthetic, in operations on the regions now under consideration. The promptness of its action, the readiness of the patient's recovery, and the absence of disagreeable after-effects, are also certainly not unimportant considerations, especially when dealing with operative measures which, to the dexterous, occupy but a few seconds, and have little or no claim to be dignified as aught but manifestations of minor surgery. In these conclusions I am confirmed by the experience of all my colleagues.

Dietetics.—A chapter on the Therapeutics of Throat Diseases would be incomplete without some remarks respecting the dietetic and hygienic measures necessary for the treatment and prophylaxis of those affections. With respect to such directions, it must be remembered that in throat affections three distinct functions are

interfered with, namely, deglutition, respiration, and vocalisation. The principal difficulty in their treatment lies in the impossibility of giving them perfect rest, two of them at least being vital functions. The great object, however, must be to give each as little work to do as possible.

In all cases of relaxation and congestion of the pharyngeal mucous membrane, every form of pepper, spices, and hot condiments should be avoided.

Ice will often be found most grateful to the throat, but, in order to avoid injury to the digestion, it should always be taken midway between meals, and not just before one.

Special dietary rules are called for in those cases in which the constitutional foundation of the local ailment is an essential feature of treatment. Recognising the lithic acid diathesis as a predisponent of a majority of throat diseases in the pharyngeal—or more correctly faucial—region, I am particular to caution against those articles of food, both solid and fluid, likely to favour fermentative dyspepsia. Further details on this head are not necessary in this place.

Soft food is often absolutely necessary in throat affections, and it is also frequently essential that such food should be given in the most concentrated form, in order to give the muscles of deglutition as little work as possible. Extracts made from fresh meat are in my judgment preferable to all concentrated preparations, however convincing the analysis of their ingredients. A very excellent form for the administration of nourishment, and one which can be employed even in very considerable obstruction of the gullet, consists of a raw egg broken into a cup, seasoned with a little salt and vinegar, and swallowed whole like an oyster. The yolk generally breaks at the moment of swallowing, and thus forms an agreeable and soothing emollient application to the throat, at the same time that it is a valuable and easily digested nutriment. An egg can be frequently swallowed in this way, when it would be rejected if taken beaten up with wine or milk. In cases where fluids regurgitate through the nose, they should be thickened with arrowroot, isinglass, or Iceland moss, and the patient should be directed to take them in gulps rather than in sips.

In those cases where, in consequence of pyloric obstruction, food is returned after a greater or less period of time, much benefit may be derived by predigestion of the food by means of peptonizing powders or pancreatic extract. The casein of the milk or the albuminous constituents of beef-tea are thus easily

converted into peptones, and absorption in the stomach is thereby greatly facilitated, while the more irritating fermentative processes are held in check. It is important to remember that food when pancreatized is apt to quickly putrefy.

Artificial Feeding.—Whenever the function of swallowing is so impaired that artificial nutriment is necessary, it is desirable, if possible, that food should be administered through the stomach by means of an œsophageal tube, rather than *per rectum*. The instrument now generally employed, and known, I think, as Krishaber's, is an immense improvement on the really formidable weapon formerly supplied with a stomach pump. When œsophageal feeding is adopted, food need not be given oftener than twice, or at most thrice, in the twenty-four hours. The same may be said of rectal enemata. Food so administered should be pancreatized, and should not be given in too concentrated a form. There can be no doubt that much harm is done by the practice of giving essences of beef or milk stronger than the intention of the manufacturers. In my experience, two eggs, with six or eight ounces of beef-tea, and possibly a little brandy, administered twice or at most thrice daily, constitute an all-efficient diet for artificial nutrition. The food should be given at a temperature of 90° to 100° Fahr., and any medicament necessary for the case may be added to it.

When the obstruction is so situated as to offer an effectual barrier to the introduction of food into the stomach, it may become necessary to consider the advisability of surgical intervention with a view of preventing a painful and lingering death by starvation. For the details of these operations the reader must refer to treatises on Surgery.

Respiratory Hygiene.—Sudden changes of temperature are always hurtful to the respiratory passages. Draughts of air striking against the throat externally, or a very sudden change of temperature in the atmosphere inhaled, particularly if just after use of the voice, are prone to set up congestion of the larynx. A cold, damp atmosphere is the worst, whereas dry air, even if cold, is often beneficial rather than harmful, as the experience of those who have tried the Davos-platz in the Engadine proves. Warm, damp south-west winds, though agreeable in laryngeal catarrh, are often hurtful to the pharyngeal relaxation, which includes, accompanies, and keeps up the laryngeal disease. The effect of damp on the discomforts experienced in polypus, and in many other diseases of the nose, and likewise on a relaxed uvula, is well known.

Our great object in advising a patient on climate must be to change the particular atmosphere which is most obnoxious. If cold, damp air is hurtful, warm and dry inhalations are indicated, and a corresponding change of residence. My own opinion of the winter health-resorts of England is not a favourable one, and I believe that if the patient cannot winter at his own home with home comforts, or in London, which is warmer, drier, and better drained than any small town can be, he had better go out of England altogether. As has just been said, all sudden changes are most injurious, and it does not much matter whether the change be from a dwelling-house, theatre, church, or ball-room; though in a ball-room there is superadded to the change of temperature the danger of inhaling dust and actual mineral particles from dresses, artificial flowers, etc.; and many patients complain of throat trouble only after exposure to this influence.

With regard to change of clothing, it is by no means always necessary for the patient to swathe himself in flannel; but he should make a difference, even though it be a slight one, according to the atmosphere, as far as clothing is concerned. There is no country where such common-sense precautions are less heeded than in England, and none where they are more necessary. In Russia, Canada, and other cold countries, all outdoor clothing is removed the moment the wearer enters a building. These remarks are equally applicable to the reverse practice of wearing too heavy clothing in hot weather. On the other hand, it is to be noted that the houses in such cold climates as those mentioned are, as a rule, much overheated.

Respirators are often of considerable value as preventatives to cold on change of temperature, and are useful in most cases in which the inspired air causes irritation of the throat. When a patient is able to breathe entirely through the nostrils, a respirator is of but little use, as Nature has provided in the nasal passages an efficient apparatus, by which the air is warmed and deprived of its noxious properties before it reaches the throat. A great deal of respiration is, however, necessarily carried on through the mouth, especially during conversation, and it is under such circumstances that the use of a respirator will be found especially grateful and valuable. The principal conditions in which the respirator is useful were well pointed out in a leading article in the *British Medical Journal*, March 3rd, 1877, in which the following remarks occur: 'In fogs the black carbonaceous particles are most irritant to the lining membranes of the air-

tubes, and a secretion of mucus is Nature's method of sheathing the tender membrane against these irritant particles. Many of them are caught on the sides of the nasal air-passages, while others become entangled in the mucus of the bronchi and bronchiæ, as is evidenced by the black colour of the expectorated phlegm. In such fogs many of those who do not resort to respirators will be found with their handkerchiefs over their mouths, converting that useful article into a makeshift respirator. The particles are largely intercepted by the respirator *in transitu*, and still more if the respiration be carried on through it chiefly, and but to a small extent through the nostrils. . . . . The respirator is exceedingly useful, too, under the following circumstances. In cold winds—especially when facing them—the cold air finds it way into the mouth at every opportunity, and so communicating with the air respired, or with the residual air in the thorax, lowers its temperature, and then hyperæmia of the lining membrane of the air-tubes is produced. The respirator will be found a great preservative under such circumstances, and will prevent many a cold, sore throat, and hoarseness. In driving in cold weather, it will be found to be very comfortable at the time, and desirable in its protecting power against unpleasant after-effects ; also in walking out with companions, when talking is necessitated, the respirator will be found very agreeable by those who find cold air so breathed to produce disturbance in the respiratory apparatus.'

Of the use of the respirator in chronic laryngitis, Solis Cohen thus speaks: 'Where the patient is exposed to the inhalation of irritant gases or vapours, or solid particles floating in the air, he should wear a respirator at the time, or cover the nostrils and mouth with a veil, or keep the mouth closed and protect the nostrils by a tiny wad of cotton, just delicate enough not to interfere with respiration. In some cases, attended with frequent cough, the respirator or its substitute should be in constant requisition to modify the effect of the oxygen of the air, which is sometimes too irritating for the over-sensitive mucous membrane. The value of the respirator in these cases cannot be appreciated by those who have not witnessed its beneficial effects for themselves.'

But while respirators are doubtless of service to many persons, especially females, in modifying the quality and temperature of the respired air, they are not without some disadvantages. They encourage the habit of breathing by the mouth in preference to the nostrils, the result of which at night is a liability to snore and

the production of a dry mouth and fauces, and a furred tongue; while, during the day-time, Nature's contrivance for warming and moistening the air in passing through the narrow, winding passages of the nostrils is rendered valueless.

Then, again, the susceptibility of the mucous membrane, to mitigate which they were devised, is apt to be increased by the unnatural and unnecessary warmth of the air engendered by these instruments, and the liability to take cold is therefore augmented.

Finally, a certain admixture of the expired with the inspired air takes place, analogous to that which takes place in an imperfectly ventilated room.

To overcome this, an oro-nasal respirator has been invented, but it is very unsightly. Less objectionable, and often very serviceable, is a simple cloud of Shetland wool, worn over the mouth and nose.

Vocal Hygiene.—It is frequently necessary to give the vocal organs rest, and even entirely to prohibit the use of the voice, especially in the case of those patients who have to exercise it professionally. This, however, is not universally the case. It would appear, for instance, that reading aloud, and talking in rattling vehicles, or in noise of any kind, is more injurious to the voice than public speaking. Such practices should therefore be strictly forbidden. Again, many singers complain of diminished range, both in their lower and higher notes, without there being any perceptible impairment of the middle register. In these circumstances directions for the modified use of the voice are indicated, and particular attention is required in order to ascertain whether the defect in the voice may not be due to faulty voice production. This subject having been elsewhere treated at some length,[1] it is not necessary here to do more than refer to it.

Where there is spasmodic vocal enunciation, or where there is the slighest ulceration or abrasion of the vocal portion of the larynx, absolute silence must for a time be enjoined.

Balneo-Therapeutics.—The benefit to be derived from treatment of disease by the aid of natural waters is by no means so highly appreciated by practitioners in England as it is abroad. One reason for this incredulity may doubtless be found in the fact that, while perhaps too much is claimed for hydro-therapeutics by our Continental *confrères*, the results of treatment by those

[1] *Voice, Song, Speech*, by Lennox Browne and Emil Behnke, London, 1883, 19th ed. 1898.

springs which we possess in England have not so far encouraged practitioners to extend their experience. Within the last few years, however, great advance has been made in this branch of treatment, and it is proved beyond doubt that the action of natural mineral waters does not depend solely, or even to any great extent, on the amount, often very small, of active ingredient which they contain, but is the result of their natural chemical combination, and of their thermal properties. It is this last principle of a natural high temperature that is to be found in almost every water of any value for bath treatment, especially of those suited to diseases of the larynx. In all the effect is produced not only, and often not at all, by their local effects, but by their eliminative action on the skin, the kidneys, liver, etc. Moreover, as regards the throat, the circumstance that 'spa cures' are for the most part undertaken in the summer is not to be ignored as an important adjuvant of the therapeutic value of the particular spring selected. For the same reason this treatment is unattainable at that season of the year when the patient is most likely to require relief for acute exacerbations, the establishments being almost universally closed in the winter months; and in this respect the waters of Bath possess unique advantages over Continental sources, though it is possible that, in some cases, exposure of the bather to inclement weather may in turn negative, or at least go far to discount, the benefit which, *per se*, the waters are capable of effecting. The springs best adapted to diseases of the throat and nose may be broadly classified as follows :—

1. The **Sulphurous**, containing free H_2S and combinations of sodium and calcium sulphides. It is doubtful whether sulphur-baths have any action other than that of perfectly indifferent thermæ. The effect of sulphuretted waters as sprays is hardly more potent than the baths—they are rather sedative when so employed. But sulphur waters taken internally have a powerful effect in reducing hepatic engorgement and congestive conditions of the gastro-intestinal tracts; they are also valuable in catarrhal conditions of other mucous membranes, particularly the respiratory. Of sulphur-springs, those chiefly to be recommended are Aix-les-Bains, Luchon, and Cauterets for bathing, Challes for drinking, and Marlioz for spray inhalations. Both Challes and Marlioz are situated very near to Aix-les-Bains—which is also to be recommended by preference, on account of the great abundance of the supply of water (one million gallons per day), and for perfection of every detail of the bath establishment. The waters of Bath have many points of similarity to those of Aix-les-Bains

—they are very abundant, and are administered in great perfection. Every detail of treatment as pursued at Aix is to be found here, even to the employment of experienced *masseurs* and *masseuses* direct from Savoy.

2. The **Saline**, characterised chiefly by the presence of sulphates and chlorates. Those rich in chlorides are the most valuable for throat and pulmonary complaints, and can be employed either as 'brine baths,' or internally as potions. Soden, in Germany, has a high repute, but of it I have no personal experience. Mont Dore, Royat, Aix, Wiesbaden, and Homburg have each a high reputation. At Mont Dore, and more especially at Bourboule, close to it, much of the benefit derived is due to the **arsenic** contained in the waters, which are of service in cases of granular pharyngitis, enlargements of glands, and in some forms of asthma. At Kreuznach, Challes, and also at Woodhall Spa in Lincolnshire, the waters are strongly impregnated with **bromo-iodine**, and are indicated in cases of scrofulous enlargement of the lymphatic glands, and in goitrous and other tumours. The waters which contain **iron** are legion, and cannot here be enumerated. Of **simple alkaline** waters, Ems is by far the most generally serviceable.

CHAPTER X

THE GENERAL ETIOLOGY AND PATHOLOGY OF THROAT DISEASES

Anatomical, Functional, Hygienic

It may be generally accepted that the throat is liable to become the seat of any pathological change peculiar to the many and varied structures which make up its component parts. Every known morbid process affecting cartilage, mucous membrane, sub-mucous and glandular tissue, arteries, nerves, or muscles, may be observed in the larynx or pharynx, and the pathological condition may affect one or several tissues.

To quote Cohen: 'Inflammations (idiopathic deuteropathic, and traumatic) occur in various grades, or occur as constituent manifestations or results of systemic affections, such as tuberculosis, scrofulosis, syphilis, cancer, rheumatism, gout, erysipelas and the exanthemata, continued fevers, diseases of the large glands, chronic cutaneous affections, and other maladies. Then we encounter the various products of inflammation—adhesions of tissues, fistulæ, strictures, glandular enlargements, tumours (benign and malignant), aneurisms, etc.; likewise wounds and other local injuries, mechanical and chemical; foreign bodies, introduced by accident or design; local results, such as œdema, pustular inflammation, and destructive ulceration, from the use of certain drugs; . . . and, finally, various disorders of nervous origin.'

It is not, of course, intended to discuss in this chapter the causation and pathological nature of all throat diseases, but only to draw attention to some main facts which underlie the general question of diseases—and especially of inflammation—in the rhino-pharyngo-laryngeal tract.

Statistics.—Before proceeding further, attention may be drawn to the want of originality on the part of British writers on Diseases of the Throat and Nose in regard to statistics, especially as to relative frequency.

I must certainly plead guilty to having too often rested content with the industriously compiled and easily gathered figures of continental workers, and I can only plead by way of palliation that I have erred in good company.

Nor do I feel inclined to omit from this edition the valuable and trustworthy post-mortem statistics of Heinze, Willigh, and others to whom I have been in past issues indebted. But I have also availed myself of the carefully kept records of the Central London Throat, Nose, and Ear Hospital for the last ten years.

The resultant figures will be quoted in this volume as **Hospital Statistics of Relative Frequency,** and the facts to be deduced will, it is believed, tend to somewhat modify impressions derived from the too readily accepted statements of previous experience.

The figures from which these statistics will be drawn are as follows :—

Total number of patients treated in ten years . . .		68,290
,, of diseases analysed		93,212
These may be further subdivided into—		
Diseases of the mouth and tongue . . .	3,902	
,, ,, fauces and pharynx . . .	22,421	
,, ,, larynx	5,609	
,, ,, œsophagus	263	
		32,195
,, ,, nose and nasal fossæ . .	16,575	
,, ,, naso-pharynx	8,393	
,, ,, accessory cavities . . .	129	
		25,097
,, ,, auricle and external ear . .	11,309	
,, ,, ,, middle ear . .	20,504	
,, ,, ,, internal ear . .	1,568	
		33,381
,, ,, ,, neck		2,539
		93,212

These figures would perhaps be modified somewhat if compared with those of private practice, but not to the extent that might at first be suggested; for the poor equally with the rich seek aid from their family attendant at the first onset of an acute illness, and it is in this direction of a relatively diminished number of acute diseases that the statistics of a hospital dealing mainly with out-patients are to some degree fallacious.

Many influences combine to intensify or to modify diseases of the throat, and so complex are they, that it is quite impossible in a general consideration of the subject to entirely separate

them from one another by any regular method. For example, disorders of respiration may arise from causes which will also influence, in a more or less marked degree, the functions of deglutition and vocalization; or each of these processes may be impaired separately and without any effect on the other. In certain circumstances the pharynx, or some portion of it, may be primarily attacked, in others the larynx. In one person a pharyngeal disease may extend upwards towards the nares, in another downwards to the larynx. Similarly, the local manifestations of systemic diseases may be exhibited in quite different parts of the throat; and it is difficult always to assign causes for these varied peculiarities. Without continuing to generalize, it may be said that from whatever point of view we consider the causation and character of throat diseases—the **anatomical,** the **functional,** or the general **hygienic**—we shall encounter these difficulties; and an attempt to clear our ground of some of them, before entering into examination of each individual throat disease, can only be successful if we acknowledge at starting that we must not restrict ourselves to any one aspect of the task.

In any general summary of the etiology and pathology of morbid conditions of this region, we have necessarily to take into account:—

1. The secretory and absorbent processes of the throat, including the nature of the secretions in health and in disease.
2. The respiratory functions of the various parts of the throat (*a*) in health, and (*b*) as modified abnormally by structural changes or external circumstance, *e.g.* insanitary surroundings, etc.
3. The throat as part of the alimentary tract.
4. The throat in relation to voice-production.

Before even endeavouring to throw into relief the more obvious factors which obtain in the commonest forms of throat disease, it is necessary to anticipate somewhat, and to draw attention to the connection between morbid conditions of the throat and those of the nose. If the nose be obstructed, its important respiratory functions of warming, moistening, and filtering the air, have to be carried on under disadvantageous circumstances by the mouth, pharynx, and larynx, and a departure from the healthy condition of these parts, in relation to all the functions just enumerated, ensues sooner or later; for it is now all but universally recognised that a majority of diseases of the pharynx, larynx, and tympanum are directly related to obstructive disorders of the nose. Nasal stenosis, whatever its cause, leads

to mouth-breathing, with its attendant evils; and in not a few instances of pharyngitis and laryngitis the sole indication for treatment is to remedy the nasal obstruction. Much literature has in these last few years appeared on this important subject of mouth-breathing, one of the most valuable contributions being the monograph of Bloch, the pupil and successor of the lamented Häck.

Amongst the causes of **mouth-breathing** may be mentioned those, first, of the *fauces*.

- Tonsillar enlargement. { Faucial. / Pharyngeal.
- Retropharyngeal abscess.
- Deformities. { Congenital. / Traumatic. / Specific.
- Neoplasms.

And secondly, of **nasal obstruction** due to intra-nasal mischief.

- Congenital stenosis.
- Hypertrophy of mucous membrane. { Acute. / Subacute. / Chronic. / Specific.
- Deviation and spurs of the septum.
- Neoplasms.
- Foreign bodies.

On the other hand, diseases of the throat caused by **undue patency** of the nostrils are included in congenital arrest of development of the turbinal bodies, atrophic rhinitis, and surgical interference.

Of almost equal importance in the etiology of throat diseases, stands the character of the nasal and buccal secretions. So long as the nasal respiratory channels are normal, and the secretions of the nose, buccal cavity, and throat, are healthy, so long will the individual be likely to escape ordinary throat troubles. It is necessary to bear in mind that the nasal and oral fluids are continually being contaminated from without by the entrance of germs and other irritants from the air, and, further, that they may be modified both in nature and amount by various diathetic states of the system.

It has also to be remembered that the throat is lined by a mucous membrane which is both highly secretory and absorptive; and it is probable that in health the secretory function is of far more importance to the organism than the absorptive. Attention has already been called to the two kinds of glands of the throat, the acinous and the lymphoid: the former are concerned principally with the secretion of a lubricating substance—mucus—and they are therefore widely disseminated over the whole mucous lining. The function, however, of the lymphoid grandular tissues has

been long a matter of speculation and conjecture, their great development in this region, and especially in the pharynx, evidently pointing to some very important duty. We have already alluded to these lymphoid glands, which, when aggregated, are known as **tonsils,** a term until recently restricted to the **faucial** lymphoid masses, but now applied to the aggregations of adenoid tissue in the roof of the naso-pharynx, at the Eustachian orifices, at the base of the tongue, in the soft palate, and in the ventricle of the larynx, and known respectively as the **pharyngeal, tubal, lingual, palatal** and **laryngeal tonsils.** Moreover, the disseminated lymphoid follicles at the back of the oro-pharynx have been named the **discrete** tonsil; this nomenclature is doubtless open to criticism, but is now so generally adopted by specialists at home and abroad, that no apology is necessary for taking advantage of it on the ground of convenience. Although the importance of these lymphoid glandular structures has been recognised on anatomical and clinical grounds, it is only during the last few years that the question of their function has been seriously treated. The older writers vaguely regarded the tonsils as having some lubricating function. In more recent times they have been rightly referred to the lymphatic system, because of their obvious structural resemblance to the ordinary lymphatic glands. It seems probable that the lymphoid masses in their substance are, like these glands, engaged in the formation of leucocytes, and that the leucocytes so formed, escape through the surface epithelium of the tonsil into the buccal cavity, where they exercise their activity in the destruction of micro-organisms and of other deleterious agents. There may possibly be other functions performed by the tonsils, but certainly there is no such definite knowledge of them as to influence in a practical sense either medical or surgical treatment.

These views being conceded, it is evident that nasal obstruction, as leading to mouth-breathing, may be an important factor in the production of unhealthy states of the buccal secretions, and that irritating products in these fluids, interfering with the proper performance of function of the lymph-secreting glands, may be a fruitful source of disease.

As regards the etiology of faucial and naso-pharyngeal lymphoid inflammation, it has been demonstrated that most forms are associated with either (*a*) external microbic influences, which contaminate the contents of the oral cavity, or (*b*) with some diathetic state in which the buccal secretions are liable to contain abnormal irritating products. Amongst the oral contaminations

of an external character may be mentioned impure food, water, and especially impure air, dependent on insanitary surroundings, as well as the presence of micro-organisms of a pathogenic or quasi-pathogenic character. The tonsillitis of scarlet fever, diphtheria, etc., may be instanced as of external origin.

Again, the chronic hypertrophic inflammatory conditions of the pharynx met with in individuals, the subjects of the strumous diathesis and of syphilis, are examples of diseases due to contamination of the buccal secretions. In many instances of pharyngitis, however, we find that to a diathetic predisposition to inflammation there is often added an exciting factor, such as cold or wet, which induces catarrh, a condition the causes of which, as will be explained in the next chapter, result from the growth and activity of pathogenic micro-organisms. Most forms of tonsillitis and pharyngitis appear to be readily explicable on a similar basis.

I am not able to agree entirely with Bosworth's conclusions in his endeavour to divide inflammatory affections of the upper air-passages by sharp, well-defined lines, into catarrhal inflammations and those characterised by fibrinous exudations. My own experience especially differs from his in respect to the statement that fibrinous exudation is a usual condition of ordinary superficial tonsillitis; its manifestation would, indeed, at once lead me to suspect a septic origin of the attack. I should hold that, except in some rare cases in young children, fibrinous exudations in either fauces or larynx are significant of microbic influences. Bosworth's subdivision of these exudations into innocent and baneful is, in my judgment, only too likely to lend encouragement to an over-sanguine prognosis.

Why some affections of the throat, arising apparently from the same causes, should sometimes commence in the nares, sometimes in the fauces, and sometimes in the larynx, is a problem which as yet is by no means solved.

By far the majority of inflammations of the larynx are of a sub-acute character, and arise as an extension from the nares or fauces in association with nasal stenosis. Why should they not by preference extend into the œsophagus, which tube is much more directly continuous with the pharynx? Cohen says: 'Most probably because the flaccid œsophagus is normally closed, except during the act of deglutition, and thus is less exposed to atmospheric influences than the patulous respiratory tract.' This answer is, however, by no means entirely satisfactory, for we see a large number of pharyngeal diseases of more or less pronounced atmospheric origin, but which never attack the larynx. A sug-

gested explanation is based on the steadily growing belief in the parasitic nature of disease. The throat affections of the exanthemata and continued fevers, as also diphtheria and almost all forms of insanitary sore throat, and probably even of rheumatism, commence, as a rule, in the fauces and pharynx—rarely, if ever, be it noted, in the nares, and preferably in patients who are the subjects of nasal stenosis. It is probable that the bacilli respectively characteristic of these conditions are both swallowed and inhaled. Those swallowed may be checked in their development by digestion; whilst in the case of those inhaled, absence of these destructive fluids and the free access of oxygen would favour the activity of their life-processes. The probability of the explanation I have here offered, of immunity of extension of pharyngeal disease to the œsophagus, is strengthened by the fact that, whilst tuberculous ulceration of the pharynx spreads, as a rule, downwards to the larynx, and but rarely upwards from that region, no case has been reported of extension from the fauces to the gullet.

We have spoken of catarrh, and it will be well, before proceeding further, to consider what is meant by 'the catarrhal tendency'—by 'taking cold'—the condition which not only predisposes some individuals to be more liable than others to respiratory affections of the throat, but which also plays so large a share in the element of recurrence.

Broadly speaking, the words imply a constitutional condition, either original or acquired, which renders the individual unable to withstand the injurious influences of a lowered temperature.

Woakes, applying the term 'modifications of nutrition to all the processes of inflammation, whether acute or chronic, as well as to some hypertrophies of tissue which are either congenital or originate shortly after birth,' endeavours to account for them all as possessing a *uniformity of type*. He argues that all these 'modifications of nutrition are traceable to an *anatomical mechanism* normally operating in the healthy economy,' and that this anatomical mechanism is to be 'found in that portion of the nervous system constituted by the *ganglia of the sympathetic* chain and its afferent and efferent branches.' In other words, he appears to consider all forms of disease of the throat, nose, and ear, from the simplest pharyngitis to diphtheria, from a cold in the head to polypus and necrosing ethmoiditis, from Eustachian obstruction to auditory nerve vertigo—as dominated by vasomotor disturbance. The arguments by which this view is supported are plausible and elaborate, but in truth do not serve us very much in a practical sense; for, so far from directing treat-

ment, as one would expect, on more purely medical or hygienic lines than has hitherto been the case, probably no English specialist of recent times has devised bolder surgical operations for the relief of these 'modifications of nutrition,' especially in the naso-pharyngeal region, than the author under notice. The theory is withal not one of entire novelty, except in the extent to which it is applied. Carried to its logical conclusion, it might be made to account for almost every disease to which mankind is subject. Primarily, without doubt, the vasomotor system which controls the circulation is at fault in the majority of throat diseases; but the catarrhal tendency—the disposition to take cold—may in a secondary but not less important sense be dependent on any one or on several of the many and varied constituents of defective assimilation and nutrition, and the practitioner will require to make careful search as to the individual causes of a baneful nature in the general health of each separate patient as he comes under notice. While, therefore, the causation of the so-called catarrhal condition may be largely influenced by circulatory defects in the constitutional state, sometimes inherited and often acquired, there is nothing to show that such an influence has any more power over the passages of the throat or nose, than it has over a similar condition in the common bile-duct. Moreover, the importance of the many constitutional, atmospheric, and functional causes for inflammation of the air passages cannot be thus ignored, minimised, or dismissed. Macintyre has brought forward strong evidence to sustain my view, expressed in the third edition (1890), that so-called catarrhal conditions of the mouth and throat are intimately related to the invasion of these regions by micro-organisms.

In connection with the constitutional conditions influencing the catarrhal tendency, we may here conveniently speak of other dyscrasiæ predisposing to throat diseases and scarcely less specific than those associated with tubercle or syphilis.

The **constitutional state** which in my judgment exercises the strongest influence on diseases of the throat, especially of the pharynx, is that known under the various and more or less interchangeable names of **rheumatic, gouto-rheumatic,** or **gouty**; the darthous, arthritic, or lithic acid diathesis. And here also there may be traced a certain relationship between the systemic cause and the local result. The simple rheumatic throat, manifesting itself by pain, especially in performance of ordinary muscular acts, with but little hyperæmia, is only to be treated by local measures of relief, supplementary but subordinate to those required of a

more general character; or, to look at the matter from another point of view, arrest of outflow from the tonsils, leading to acute inflammation, and perhaps suppuration, will occur, under etiological conditions favourable to a general rheumatism, and will be ushered in by all the constitutional signs of the same malady. Like general rheumatism, no sooner is one side of the throat relieved, than, in many instances, the opposite side is similarly attacked; while, if the throat affection be arrested by local measures only, a sharp attack of muscular or articular rheumatism may ensue. Again, granular pharyngitis, a lesion of the discrete lymphoid follicles of the pharynx, although often excited by causes of a functional character, generally occurs in an individual with certain well recognised faults of general secretion and assimilation, in association with some well-marked diathesis or with nasal obstruction. On these accounts, and for many other reasons, it is, in my opinion, a mistake to suppose that there is a special individuality of pathology in the case of the throat to anything like the extent that we find in that of the eye or ear.

Second only to the darthous diathesis which, as first expressed to me in a private letter from the late Sir Andrew Clark, in all probability underlies both acute rheumatism and tonsillitis, stand the various exanthemata and other fevers, and the strumous diathesis, as predisposing factors in throat diseases. These will, however, be more conveniently discussed later, under the various headings appropriate to each disease.

It remains to be noted that there are many **anatomical** facts of a surgical character, apart from the results of nasal stenosis, which exercise influences of a special nature on throat diseases.

Just glancing at clefts and unduly high arching of the palate as troubles purely anatomical, we may see how in the close attachment of the mucous membrane to the bony palate there is a predisposing cause to disease of periosteum and bone in cases of inflammation and ulceration in this region; and on account of its muscular arrangement, as well as of its physiological duties, how important is the health of the soft palate to all the functions of the upper portion of the throat.

The intimate connection of the faucial tonsil with the pharyngeal muscles accounts for the pain in deglutition in all inflammations of these glands. Enlargement of these structures as a cause of deafness is not, as was formerly taught, due to closure of the Eustachian tube by direct pressure of the enlarged mass. Such pressure is anatomically impossible, and the cause of the deafness is to be found rather in extension of the chronic inflammation and

thickening from the gland to the tube, and by disturbance of the muscles of the soft palate connected with patency of the Eustachian orifice. The laxity of attachment of the pharynx, so necessary to its mobility and contraction, accounts for the disposition to effusion and suppuration in its surrounding connective tissues, whilst its close relationship with important vessels adds very specially to the dangers of all such inflammations and abscesses. To the looseness of its connections may also be ascribed much of the liability to ulcerations, to the formation of pouches, to the lodgment of foreign bodies, and also in a measure to varices. The difference in thickness and tension between different parts of the mucous and submucous linings of the larynx accounts for the varying liability of the different portions to congestion and œdema.

Treves asserts that 'the affection known as clergyman's sore throat has an interesting anatomical basis,' which he thus explains: 'The mucous membrane of the larynx is well provided with mucous glands, whose function it is to keep moist the parts concerned in phonation. When an individual speaks aloud for a long while, the lining of the larynx tends to become dry, on account of the large amount of cold air that is drawn directly through the mouth. To still keep these parts moist the mucous glands have to exhibit increased energy; and in those who speak much in public, the glands may in time become so overworked as to inflame. It is the inflammation of these glands that constitutes the present affection. The glands are not distributed equally over all parts of the larynx, but are most numerous in the membrane between the arytenoid cartilages and parts immediately about them, the base of the epiglottis, and the interior of the ventricle. It is in these parts, therefore, that the changes in chronic glandular laryngitis, or dysphonia clericorum, are most marked.' The statement is quoted at length, because there is no doubt that the views represent the prevailing notions as to the pathology of speaker's and teacher's throat; but, after what has just been said, it must be evident that abeyance of the nasal respiratory function in consequence of obstruction, the associated microbic and chemical contamination of the oral and pharyngo-laryngeal secretions, and the consequent changes in the lymph-secreting mechanisms, are factors of equal, if not of greater, importance than any primary lesions of the mucous glands themselves. The idea that simple much speaking, independently of faults in the method of voice production, will lead to laryngeal inflammation, must be accepted with some reserve; for, as it is hardly necessary to

remind the reader, only a small percentage of clergymen and other active voice-users suffer from the disease.

Of very great importance in all **nervo-muscular diseases** of the larynx, are the anatomical relations of the recurrent laryngeal nerves, already described. From their course and their vicinity to vessels, glands, etc., it is easy to understand that aneurisms and enlargement of glandular structures may cause pressure on one or both nerves, and thereby give rise to characteristic and well-defined symptoms in the larynx, to be considered more in detail in the section devoted to laryngeal neuroses. When the nerves supplying the intrinsic muscles of the larynx are injured, vocalisation must be, and respiration may be, impaired; and further on it will be seen how numerous are the causes which may affect the movements of the vocal cords.

Regarding **new formations**, any inflammatory thickening of, loss of tissue from, or new growth upon, the epiglottis, will cause embarrassment in deglutition, but will not always influence the voice, affecting other parts of the larynx; similar conditions are apt to modify phonation.

It is astonishing how much *lateral* displacement of the larynx, from pressure of external tumours, may take place without embarrassment of either voice, deglutition, or respiration; but when there is the *slightest constriction*, as in those forms of goitre the lateral lobes of which embrace and compress the trachea and gullet, dyspnœa, and later dysphagia, become prominent and distressing symptoms. This interesting question has been illustrated by various specimens exhibited by me at the Pathological Society (vols. xxv. and xxvii.); and also by a short paper entitled 'On the Causation of Dyspnœa in Suffocative Bronchocele,' which appeared in the *American Journal of the Medical Sciences* for April 1877.

Foreign bodies may be causes of discomfort in all parts of the throat. Naturally, if the situation is in the larynx, respiration will be embarrassed; but even when impacted in the œsophagus, a foreign body is liable to press against the trachea, and so give rise to respiratory symptoms.

When the **œsophagus** is the seat of malignant ulceration, the points most frequently attacked are (1) opposite the cricoid cartilage, which offers the only point of resistance on the anterior wall of the œsophagus, and (2) at its entrance into the stomach.

We have now to consider the various **functions** of the throat in their etiological relations to disease.

Respiration.—One of the main predisposing causes of respira-

tory troubles in the throat is an unnatural method of breathing through the open mouth, the result of morbid obstructions in the nose, in consequence of which the air is taken directly on to the mucous membrane of the pharynx and larynx without the influence of the warming, moistening, and filtration processes to which it is subjected when inhaled through the natural first avenue of the nostrils. I cannot admit with Gottstein that the nasal cavity 'imperfectly fulfils its normal function in this direction,' for any defect in its action is due sometimes to stenosis, sometimes to a pernicious habit, or, it may be, to a pathological process brought about by vices of civilization. Long-continued mouth-breathing not only gives rise to pharyngeal and laryngeal mischief, but it also intensifies, if it does not originate, many nasal disorders. It is perhaps not out of place to suggest here that Gottstein's strong advocacy of nasal tampons indicates a want of appreciation of, or at least of respect for, the physiological duties of the nasal fossæ. Such measures would appear to be far more calculated to cause than to cure nasal disease. Another respiratory cause of throat disease, to be frequently referred to in these pages, is an imperfect method of filling the lungs and of economising the air in its exit during voice use.

Akin to the function of respiration is the influence of the **general circulation** on throat diseases. We find local congestions and inflammations occurring in the full-blooded subject, and local muscular enfeeblements in the anæmic. We find also local varices associated with evidence of a like nature in other parts, such as rectal hæmorrhoids, varicoceles, varicose veins of the lower limbs, etc., and with them similar general constitutional symptoms. Some cases are explained by constitutional states, some by functional local strains of the same nature as produce the like effects elsewhere. The influence of disorders of the **menstrual function** on the respiratory passages is so well marked, as in ozæna and some so-called hysterical throat symptoms, that we are often led at once to make pertinent inquiry in this direction, and with the result of more widely applied and more complete therapeutic measures.

Diseases of the throat in relation to the functions of **deglutition** are often due to disobedience of physiological laws in performance of the act of **mastication**. Deficient natural teeth, or imperfect action of artificial substitutes, give rise to many functional disorders of swallowing, and may even be the precursor of organic lesions. Local irritation of food unduly hot in temperature, or *piquant* in condiment, will lead to undue capillary stimulation, with

reactionary relaxation and congestion. The frequent taking of ices and iced water is doubtless also a source of many throat disorders, but not, in my experience, to anything like the extent caused by the contrary practice. In either case the effect on the laryngeal mucous membrane is similar to that due to sudden alternations in the temperature of the inspired air. Alcoholic drinks exert, for the most part, except in their more ardent forms, a local influence on the throat mainly through the general system. But there are so many specially characteristic symptoms and effects produced from this cause, that there can be no doubt as to the directly deleterious action of stimulants on the organs of the voice.

I have reserved for the last the consideration of functional abuses of the voice as causes of throat disorder, though on the importance of **defective voice-production**, in this respect, I hold very strong views, probably stronger than those generally taught or accepted. Mandl was the first to point out that fatigue of the voice is a direct result of a wrong process of use, and, having for many years been convinced of the truth of his teaching, I have lost no opportunity of enforcing it, both in treatises, pamphlets, and lectures. I go even further than Mandl, and believe that the special proclivity of singers to throat troubles—a generally admitted fact—is due entirely to vices or imperfections of cultivation. Carl Seiler, as the son of a most distinguished author and teacher, has naturally grasped the fact, and his explanation of the causes of granular pharyngitis is so complete in this direction, that it should be laid to heart by all teachers of singing, as well as by physicians. I am not able entirely to agree with Seiler, Cohen, and others, who think that various portions of the larynx, and even the vocal cords themselves, are often over-strained 'in singing, screaming, public speaking, prolonged reading, talking to the deaf, quarrelling, and so on'; for not only have I rarely found local evidences of such a condition, or local treatment of the larynx of avail in such cases, but, on the other hand, I have seldom failed to find the cause of any vocal defect in the nose or pharynx, nor to effect a cure by surgical treatment of those regions, supplemented by educational correction of a functional fault in production. I say this with a full appreciation of the increasing attention recently devoted to the so-called singer's nodes as causes of voice defects, and to the removal of these by surgical treatment. According to my experience, the frequency of such nodes is very much exaggerated, and when they do occur they are often amenable to correction of faults in method, nor have I yet dared to treat one surgically,

doubting the probability of the restoration of pure tone after such a procedure, on an intrinsic portion of the vocal organ.

I am here tempted to make two digressions, first as to the value of knowledge gained by the laryngoscope as an aid to the attainment of greater perfection in the vocal art, and by consequence as a safeguard against diseases due to functional abuse; and, secondly, on the question of rest *per se* as a curative agent. As to the first, it is very unfortunate that great singers, whose perfection is, to a large extent, the gift of nature, should, because they have not felt the necessity of physiological teaching, ignore its value to the less highly gifted! and it is especially to be regretted that at least one throat specialist—a highly respected American *confrère*—who has the reputation of being also a fine singer, should have given his support and weight to the screechings of the uninitiated against the capability of the laryngoscope to render help in formulating methods of voice production; and the rather that his recognition of the more prominent causes of vocal disability is evidently founded on much laryngoscopic experience. Such objectors particularly forget that the laryngoscope was an invention, not of a physician, but of a professor of singing—Manuel Garcia—and was the direct outcome of his endeavours to settle certain disputed points on the question of tone production in the larynx. The investigations of that famous teacher have not only had that effect, but they have led to the formulation of certain laws in teaching which were previously promulgated only as ideas. My views on the importance of scientific teaching as the foundation of good singing having been enforced with particular detail in many lectures, to which those interested may be referred, and also in *Voice, Song, and Speech*, I must limit further present reference to the subject to enumeration of only a few instances of the value of laryngoscopic teaching. It may be noted that (1) the laryngeal mirror proves the absurdity of supposing that the ventricular bands approach in tone production—a supposition on which a very pernicious school of teaching is founded; (2) by the same means may be demonstrated the various methods of commencing and of ending a tone; (3) a pupil may be shown, and therefore be better enabled to appreciate, the various positions of the cords and the shape of the space between them in production of the different registers; and (4) the injurious effects of forcing the registers beyond their natural limit may be similarly demonstrated. And akin to these lessons in the larynx, demonstration of the action of the soft palate in tone production enables the pupil to appreciate the importance of

exercises directed to strengthening and developing the agility of the muscles in this region.

The subject of **rest** as a curative agent may appear out of place in a chapter on the Causes of Throat Affections; but as I have shown how important it is to recognise faults in method as etiological factors of disease, I would here incidentally express my equally strong conviction that, while rest may obviate functional difficulty for so long as it is observed, it does not prevent speedy relapse of a trouble due to wrong productions, so soon as functional activity is resumed, provided the fault of method remains uncorrected. It is in the want of recognition of this fact that an explanation will be found for the frequency of recurrence of the majority of the vocal disabilities of singers, for it is undoubtedly true that the best singers and the greatest orators enjoy the greatest immunity from functional disability, and this because, though they exercise the organ largely, they exercise it rightly, and therefore without evil consequence.

It remains only to touch on a few **hygienic** factors in the etiology of throat disease; amongst which may be named those of climate or atmosphere, occupation, surroundings, and clothing.

Concerning **atmosphere** and **climate,** John N. Mackenzie has, with much originality and vigour, written on the 'geographical limits of catarrhs,' and has laid down certain propositions, with most of which I can but express complete agreement. He says: 'In those countries where extremes of temperature follow each other in rapid succession, where the thermo- and barometrical fluctuations are most sudden and occur with the greatest frequency, and where the material composition of the atmosphere is continually changing, catarrhal affections of the naso-laryngeal tract are most frequently met with. The appearance of the disease seems to depend not so much upon the degree of heat or cold, as upon the rapidity and intensity of the change from one to the other.' In this way is explained the origin of severe catarrhs in warm weather, on occurrence of cooling showers, or from the influence of cold, damp nights in tropical climates. The influence of season is also explained; for, 'while spring and autumn furnish perhaps the largest percentage of nasal and laryngeal catarrhs, the coryza which appears in the summer months, when the air is suddenly cooled or altered by electrical and other disturbances, yields to none in the severity of its symptoms and course.' I entirely agree with the same author's statement that the injurious effect of cold *per se* has been grossly exaggerated; on the other hand, excessive moisture—*i.e.* damp—

exercises a potent influence in production of catarrhal inflammations, and is almost equally intensified for evil by oppressive heat as by extreme cold.

That the inspiration of cold dry air is not harmful (except on sudden change from heat), but, on the contrary, beneficial, we now know by manifold experience of the treatment of phthisis by residence on snow-covered mountain plateaus; but it is different when we consider dry cold air as it may strike the larynx or its neighbourhood externally, either as a draught on an overheated body, or by exposure to keen north or north-east winds. From such a cause, acute inflammation, with deficient mucous secretion and with marked spasm, may occur. The only apparent cause, in some cases of abductor paralysis, is of such a nature. It is doubtful if hot winds, unaccompanied by moisture, act as factors in the causation of throat diseases. I have not sufficient evidence to make any assertion on the subject, but I am inclined to think that, while keen draughts of cold air acting on an overheated and fatigued individual may predispose to submucous forms of inflammation (œdema), inspiration of damp cold air, wet clothing, etc., are the main etiological factors of surface inflammations.

Just touching on the question of **soil**, and noting, for instance, the difference of liability to throat affections of those who reside on clay as contrasted with the comparative immunity of inhabitants on gravel, we observe that, in regard to diphtheria, the frequency of this disease, and also the mortality due to it, are greater on retentive and damp soils than on pervious and dry ones. It is also more frequent in cold damp weather.

We next come to **dust** as a cause of naso-pharyngeal and laryngeal disease. I am here unable to express agreement with John Mackenzie that 'comparatively few cases of inflammation originate in this way'; for I have seen many instances in which the dust of a ball-room, of a country road, or of the street, has been the direct, constant, and apparently the sole cause of an attack.

Case III.—A gentleman, formerly under my care, suffered from severe coryza, with symptoms of pseudo hay fever and asthma, from dust, however inhaled—as, for instance, in the course of a ride on horseback. This patient also found the dust arising from wood pavement—with which much insanitary material is, as it were, incorporated, to become separated in dry weather—peculiarly provocative of attacks.

This is by no means a solitary case. That the dust is the exciting cause is proved by the fact that, in many instances, immunity against its influence may be ensured by the simple measure of anointing the inside of the nostrils with vaseline.

And this leads me to say that I believe it will generally be found that the *predisposing* cause in all cases of inflammation excited by dust—and, indeed, of many other varieties—is an unduly hyperæmic and hyperæsthetic condition of the coverings of the middle and inferior turbinated bones. This subject will receive further discussion later.

Allied to this question of dust are the injurious results, frequently witnessed, from the breathing of insanitary germ-laden atmospheres, due either to unhealthy surroundings or imperfect ventilation, and the similar consequences resulting from the overcharging of the atmosphere with volatile matter of a poisonous nature—as occurs in the neighbourhood of certain chemical and other works, and especially in rooms filled with tobacco smoke. I have elsewhere treated[1] at such length of the use of tobacco as a frequent cause of throat disorder in singers, and in a less degree in all brought under its sway, that I will content myself here with saying that there is little reason to doubt that the inhalation of an atmosphere charged with tobacco smoke is far more baneful in its local effects than the habit of moderate smoking in the open air or in well-ventilated apartments. The explanation of this fact is so obvious as not to require more detailed consideration.

Finally, allusion should not be omitted to the established fact of the promulgation of disease, especially of tubercle, by the contagion of germs inspired through the air-passages.

In the matter of **clothing**, insufficiency of covering and retention of damp garments are more liable to induce throat diseases than too much clothing, unless, in the latter case, the patient is careless to regulate the amount according to the changes of temperature to which he may be subjected. Russians and Canadians, who wear the warmest furs out of doors, but instantly remove them on entering a dwelling-house, are less liable to throat diseases than the English, who sit through a two hours' service in church with overcoat and other extra outdoor coverings; or who, on the other hand, will stand at an open grave on damp clay permeated with exhalations from decaying matter, and with head uncovered, quite irrespective of the wind or weather. As a converse of the proverb regarding one marriage leading to others, attention to the much more serious truth that many deaths arise from disease directly engendered by funeral attendance at the grave-side, should be more generally urged on the public; and this fact is one strong argument added to the many others in favour of cremation.

[1] *Voice-Use and Stimulants*, London, 1885.

CHAPTER XI

ETIOLOGY OF DISEASES OF THE THROAT AND NOSE

BACTERIOLOGICAL

IN former editions of this book attention has been drawn to the influence of micro-organisms in the etiology of disease in the nose and throat. Such organisms are very widely distributed,—in the air, in the water, in the soil; they are to be found flourishing on the bodies of men and animals, and in such of their cavities as are in communication with the external air.

The important part which microbes may play in almost every physiological and pathological process is now so generally recognised, that a knowledge of bacteriology has become absolutely necessary in all departments of medicine and surgery; and notwithstanding that fresh facts are daily modifying previously accepted views, the science is sufficiently established for application to practical purposes, and it demands our special attention.

For in the regions of the throat and nose we have a field for observation of micro-organisms unequalled, perhaps, in any other part of the human body, whilst in no other region is their influence more likely to be exercised.

HISTORY.—The study of micro-organisms may be said to date from the year 1675, when Leeuwenhoeck gave an account of the larger species of bacteria which he had found in animal excretions. In 1773, Müller attempted to define their characters and to classify them. The next epoch was in 1838, when Ehrenberg described various forms under the name of *Vibriones*, which, however, he considered to be animals, an opinion which was shared by Dujardin (1841); but Robin was the first to point out, in the year 1853, that there were many points of resemblance between Ehrenberg's Vibriones and the undoubted *Alga leptothrix*. Finally, Davaine insisted, in 1859, that they were plants and not animals, and since that time the position of bacteria in the vegetable kingdom has been undisputed.

As early as the year 1776 it had been shown by Spallanzani that certain impurities are present in the air, and that these are capable of setting up fermentation, the process not occurring if they be rigorously excluded. This observer advanced the theory that spontaneous generation of fermentation-producers never occurs, and the view was supported by Schulze in 1836, Schwann in 1839, Helmholtz in 1843, and Schröder and

Von Dusch in 1854, all of whom had described experiments testifying to the accuracy of their conclusions.

Pasteur, in 1860, by carefully conducted and controlled investigations, placed the relation borne by bacteria to the processes of fermentation and putrefaction on a scientific basis; the result of his experiments being to identify the active agents of fermentation with the organisms which may be found in the air. Rather later, Tyndall, in England, proved by means of experiments with beams of light on moving air, that the atmosphere which surrounds us, both within and without our dwellings, is loaded with solid impurities.

In 1865, Pasteur made the further important discovery, that certain atmospheric organisms, when in the spore condition, are able to withstand the temperature of boiling water; and, in 1876, Cohn and Koch conducted a series of careful experiments on spore-formation in bacteria.

The next great advance occurred in the year 1877, when Weigert introduced the use of aniline dyes as staining re-agents; whilst the modern science of bacteriology may be said to have been founded when solid culture media and the method of 'plate-culture' were first employed by Koch, to whom undoubtedly belongs the credit of the epoch-making discovery of the causal relationship of bacteria to disease.

The specific microbe of *diphtheria* is that which next attracts attention. Sternberg draws attention to the circumstance that it had been first detected by Klebs, and the fact published so far back as 1875, giving a reference, which, on examination, shows that Klebs not only detected the rod at the date mentioned, but that he also made an effort to cultivate it, and, so far as we can judge, successfully. To Klebs, therefore, is due the credit of having discovered this organism; but since he never definitely announced that he had been able to obtain pure cultures of it, he failed to establish its causal relationship to the disease. This was effected by Lœffler, who made pure cultures of the bacillus obtained from the throat membrane, and communicated the disease to guinea-pigs and birds, by inoculating them on the pharynx, larynx, and other parts with the cultures. He made experiments upon various other animals, which led him to state that there is a great variation in susceptibility to the infection; rats and mice, for instance, being declared by him to be very refractory to inoculation. In no case did he find the organism in any other place in the body than at the site of introduction.

The name of Lœffler will therefore always be associated with the *diphtheria bacillus*, and especially because of his commendably painstaking investigations of its specificity and of his reticence in announcement of the facts until 1884. Lœffler gives credit to Laycock for having given the hint that diphtheria was caused by a vegetable parasite, which, he supposed, was the *Oidium albicans*; and Hillier had found the *leptothrix buccalis* in the pseudo-membrane. Oertel also was an early believer in the microbic origin of this disease.

In 1881 some valuable additions to the subject were made by Koch, who further, in 1882, published his great discovery of the *tubercle bacillus*. He found that solidified blood serum was the most suitable medium for the growth of this organism, but for a very long time had great difficulty in obtaining a pure culture; this, indeed, was at one time thought impossible of achievement. His experiments were chiefly made with the lymphatic glands of guinea-pigs recently killed after inoculation with tubercular material some weeks previously.

This indefatigable worker also brought to light the *comma bacillus* of Asiatic cholera in 1884; and Nicolaier, in the same year, described the *tetanus bacillus*.

Nor do these discoveries exhaust the list, for much excellent work has been done in the bacteriology of many other diseases whose specificity has not always been so definitely determined, and no department has surpassed that pertaining to the throat and nose in importance and interest of the ascertained facts. The majority of these will, however, more appropriately receive detailed attention in the chapters relating to the various diseases.

Classification of Bacteria.—Attempts in this direction have, so far, not been very successful; and because of wide variations in

the life histories of microbes, a methodical arrangement based on those lines has not yet been found possible. Cohn has classified bacteria according to their form, as the most simple and most easily recognised method, for all are unicellular organisms. He arranges them in three divisions:—(1) **Sphero-bacteria.** These are rounded or somewhat oval in shape, and are also called micrococci. (2) **Micro-bacteria.** These are rod-shaped, and are known as bacilli. (3) **Spiro-bacteria,** which have the form of a spiral, curved rod, or corkscrew.

Another method of classifying bacteria is that employed by Roux, who divides them into two groups, the **endosporous** and **arthrosporous**; the former implying those forms in which the spores develop within the cell, the latter group those in which individual members of a group assume the character of spores and themselves give rise to new groups.

A good working classification is the morphological. This includes—

A. Micrococci or Spherical Bacteria
- 1. Single cocci.
- 2. In pairs—diplococci.
- 3. In groups—staphylococci.
- 4. In chains—streptococci.
  - *a.* Short and rigid.
  - *b.* Flexuous.
  - *c.* Conglomerate or Battalion.

B. Bacilli or Rod-Shaped Bacteria
- 1. Straight, curved, and spiral.
- 2. Showing flagellæ.
- 3. Spore bearing.

Pursuing the morphological classification, let us consider these organisms in more detail.

The **spherical** forms or **micrococci** are minute round cells, in diameter averaging $\frac{1}{25000}$th part of an inch, and are amongst the

Fig. CXXXVI.—Free Diplococci, × 1000 (after Fränkel and Pfeiffer).

Fig. CXXXVII.—Encapsuled Diplococci, × 1000 (after Fränkel and Pfeiffer).

smallest of pathogenic bacteria; they are found either isolated or in colonies. When arranged in groups of two, forming pairs, they are termed **diplococci.** These may be free (Fig. CXXXVI.) or

encapsuled (Fig. CXXXVII.), the latter constituting an organism of far more serious import. When they form a short and rigid (Fig. CXXXVIII.) or it may be flexuous (Fig. CXXXIX.) chain, they are named **streptococci**; several of these rigid chains may be placed so closely together as to give rise to a conglomerate or

FIG. CXXXVIII.—*Streptococcus rigidus vel brevis*, × 1000 (AFTER LEHMANN AND NEUMANN).

FIG. CXXXIX. — *Streptococcus flexuosus*, × 700 (AFTER LEHMANN AND NEUMANN).

FIG. CXL.—*Streptococcus conglomeratus*, × 800.

battalion-like arrangement (Fig. CXL.). In the case of complex diphtheria with streptococcal associates, this difference in arrangement seems to imply varying degrees of virulence; the least severe being the rigid, the most dangerous the battalion variety. Grape-like clusters of cocci are known by the term **staphylococci**

FIG. CXLI.—STAPHYLOCOCCUS, × 800 (AFTER LEHMANN AND NEUMANN).

FIG. CXLII. — BRISSOU COCCUS (AFTER LOUIS MARTIN).

FIG. CXLIII. — TETRAGONUS, × 800 (AFTER LEHMANN AND NEUMANN).

(Fig. CXLI.); while the term 'brissou' (Fig. CXLII.) has been applied to a certain grouping, by which the cocci are gathered as in rosettes of three to ten in number; in other words, in small groups of staphylococci, but just as frequently in pairs, then forming, in fact, a diplococcus. Lastly, the coccus may be

arranged in little parcels of four, and is then known as tetragonous (Fig. CXLIII.). There are the main groupings, but the varieties of diplococci, streptococci, and staphylococci, are almost legion. These do not require to be here enumerated. Two specimens only are given, that of *Streptococcus pyogenes* (Fig. CXLIV.), found in suppurating tonsillitis, and that of erysipelas (Fig. CXLV.), which may be found in the severer forms of septic pharyngitis. Other organisms of recognised specificity, such as those of diphtheria and tubercle, will be found more appropriately placed in the chapters devoted to their consideration.

The **rod-shaped forms** or **bacilli** vary in length from $\frac{1}{12000}$th to $\frac{1}{6000}$th part of an inch, though a few are even longer, especially some of those varieties possessing flagellæ, and these are, of course, motile, though the significance of flagellation is not now-a-days so restricted as formerly. Some bacilli have the power of forming spores, which are much more resistant to external influences than

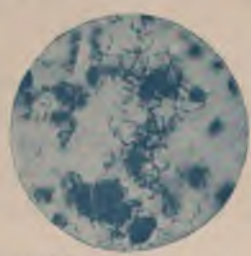


FIG. CXLIV. — *Streptococcus pyogenes*, × 500 (AFTER FRÄNKEL AND PFEIFFER).

FIG. CXLV. — STREPTOCOCCUS OF ERYSIPELAS, × 500 (AFTER FRÄNKEL AND PFEIFFER).

are the bacilli themselves; chemical and physical agents which easily kill the organisms having little or no influence on the spores.

Bacteria are clinically classified as **pathogenic** and **non-pathogenic**. The latter are believed in present knowledge to be harmless, since they are found in healthy tissues and constitute the great mass of those microbes found in the air, water, and the cavities of the body in communication with the external atmosphere, and unassociated with any definite morbid attributes. Their products are either non-poisonous, or are eliminated from the body before they can produce any injurious effects. Possibly they cannot find in the healthy body conditions which are favourable and soil which is suitable for their growth and activity. As to the **pathogenic**, it is difficult to say exactly at what stage morbid changes in tissues or injuries will confer virulence to a

possibly innocent organism, or whether indeed such a change can occur. We term an organism **pathogenic** when it is capable of developing in the animal body, and possesses the power of injuriously affecting the individual by the generating of poisonous substances; or, in other words, when it is capable of producing toxic effects.

It has been proved that in the case of diphtheria, a typically specific bacterial disease, the bacillus—said to be situated only on the surface—liberates a **ferment** or **enzyme**, which produces poisonous albumoses and an organic acid, which in their turn are responsible for all the constitutional symptoms of the disease. The toxic product, when injected into an animal, will produce the characteristic symptoms of paralysis, syncope, etc. From this, therefore, it may be concluded that it is not the mere presence of the microbe which causes the symptoms, but the consequent production of a poison which enters the system and produces a toxic result, a conclusion which is confirmatory of the ptomaine theory of this disease, advanced by me in the second edition of this treatise published early in 1887.

It is right to add that recent information may lead to a considerable modification of the ferment theory, since Frosch, Bulloch and Schmorl, Kanthack and Stephens, and others, have found the bacillus of diphtheria not only in remote portions of the lungs, whither they might arrive by the trachea and bronchi, but also in lymphatic glands, lymphatic vessels, and finally in the spleen. Klein also has shown that the Klebs-Lœffler bacillus is possessed of an intrinsic virulence which can persist after the organism has itself been destroyed by heat.

In most **specific diseases** a certain well-marked and definite form of micro-organism is found associated with a particular malady; of such, anthrax and tubercle may be given as well authenticated instances. We are therefore led to conclude that each specific disease possesses its peculiar **specific microbe**; for, in the case of many diseases, micro-organisms have been discovered and isolated, so as to leave no doubt that they, and they alone, are the exciting cause of those diseases.

Koch insists on the following 'postulates' before a given micro-organism can be accepted as the cause of a given disease:—

First, The microbe must be found in the living or dead body of the subject of the disease.

Secondly, It must be capable of cultivation on artificial media outside the body.

Thirdly, The microbe thus cultivated must be able to produce the same disease when introduced into the tissues of a healthy animal.

Lastly, The same microbe must be found in the body of the animal so treated.

If all these conditions are fulfilled, then the microbe may be considered to be the **exciting cause** of that particular malady. In some diseases, notably lupus, of the microbic origin of which there can be no doubt, the bacillus has been demonstrated so rarely that one cannot but be suspicious that, in these exceptional instances, there has been an infection with an allied disease—tubercle in the case of lupus—or that the failure to identify the specific organism is due not to its absence, but to some defect in the fixing, hardening, or staining process.

The two principal factors which seem to determine whether a micro-organism can invade and multiply in the tissues are, *first*, a predisposition on the part of the tissues; and, *secondly*, the possession of certain special properties which enable the microbe to live and develop there. Very slight alterations or changes in the tissues may determine whether or not a given microbe can find a suitable soil for its development. Thus pathogenic bacteria may settle on healthy tissue, but may not develop unless the normal functions or secretions become altered by traumatism or some other predisposing cause. The human body is at all times in process of invasion by many bacteria, both pathogenic and non-pathogenic, but happily the greater number are thrown off or destroyed. Lister has proved that healthy urine does not contain them, and the conclusion has been drawn that they do not pass through the system, but are destroyed within the body, or that they accompany the fæces.

Mention has been made of the chemical life-processes of micro-organisms. There have been identified from the human mouth between fifty and a hundred different microbes, of which many have been cultivated, but only a third have been considered to be of a pathogenic or quasi-pathogenic character. Unfortunately, the pathogenic nature of many of them has been inferred from the morbid effects produced on rabbits, mice, and other small animals injected with the bacteria adulterated saliva, and the fact that in many instances the blood and tissues of these inoculated animals swarmed with the same organisms, which the salivary injection contained, has been held to prove the pathogenic nature of the organism in question. Such a test, however, scarcely establishes the pathogenic nature of a microbe in relation to the human sub-

ject, which is *the* point of practical importance; and, moreover, the fact that small animals often die after injection with morbid salivary secretions without the reproduction of the organism supposed to be pathogenic, although held to prove that the microbic life-processes have resulted in chemical poisons inimical to the life of the animal experimented upon, by no means necessarily leads to the inference that the poison is, when present in the buccal fluids, of any pathogenic importance as regards the human economy.

The more advanced our knowledge of bacteriology,—in other words, the more complete our investigations into the life-history of microbes,—the more do we recognise the difficulty of an absolute and definite differentiation of bacteria without carefully considering the properties, peculiar characteristics, chemical reactions, and mode of development on different media. Valuable as is microscopic examination, it must always be subservient, for there are many bacteria which morphologically resemble each other, and can only be distinguished by cultivation on different media, and by those other methods just mentioned. Moreover, changes of a vital character can really be produced by **varying the conditions of growth,** such as temperature, moisture, and medium, so that we can understand the possibility of a so-called non-pathogenic microbe developing under certain conditions into one of a pathogenic nature.

On the other hand, many authorities oppose this theory of **pleo-morphism,** and maintain that the properties are constant, and that a microbe cannot acquire different properties and powers from those common to its species, and possessed by it *ab initio.* Koch does not dispute that mutability of species is possible, but rather that no conclusive evidence has been produced to prove it; also that a certain property of a species may, by proper cultivation, be brought into greater prominence; but, he denies that a new property can be acquired by cultivation, or by other changes in the surroundings. Of these surroundings may be mentioned the association of the specific bacillus of diphtheria with other non-specific micro-organisms of varying virulence. Thus, an attack of diphtheria may be modified or intensified by the co-existence of a diplo-, a staphylo-, or a strepto-coccus.

Micro-organisms, like all other living things, require a supply of **oxygen** to carry on their vital processes. Those to whom an abundant supply is necessary, Pasteur has named **aerobic**; whilst those that do not appear able to make use of oxygen, in the free

state, but which themselves disengage this gas from different media, and utilise it in its nascent state, are called **anaerobic.** To some members of this latter class, the presence of free oxygen appears to be actually toxic, while others; less exacting in their requirements, can live either with or without oxygen.

Approaching now more closely the subject of micro-organisms in relation to the **nasal and oral cavities,** we have already noted that innumerable microbes are being continually inhaled in the air we breathe, and swallowed with the food we eat.

Amongst those which inhabit the healthy mouth must be included *leptothrix buccalis*, which, under certain circumstances, appears to produce *mycosis tonsillaris* and so-called follicular pharyngitis; also the *diplococcus of Fränkel*, which seems to be so intimately associated with acute lobar pneumonia; *staphylococcus albus* and *aureus*; and *streptococcus pyogenes*, which are general concomitants of suppurating processes in the mouth and elsewhere. Netter has demonstrated that diplococci and pneumococci are sometimes present in healthy saliva, and Miller and Macintyre have shown that they are constantly to be found in the mouths of individuals presenting no deviation from the normal. Furthermore, such microbes may be the starting-point of zymotic diseases, such as scarlet fever, measles, and smallpox, in which probably the germs, together with their poisonous products, gain access to the blood-stream, or, as in diphtheria, where, at any rate in some cases, the chemical poison alone appears to enter the system, the microbes remaining for the most part on the surface of the false membrane.

From the time of Bretonneau and Trousseau, not only have bad teeth been said to predispose to diphtheria, but a special variety of gingival diphtheria has been actually described.

Several investigators have done splendid work in this field. Miller of Berlin has described over twenty different micro-organisms found in the mouth alone; whilst Vignal and Wright have recorded no fewer than one hundred different varieties.

Miller arrives at the conclusion that the bacteria which are found in the oral cavity may be divided into two groups:—*First*, those which result in the production of septicæmia with only slight local lesions; *secondly*, those which produce pyogenic lesions or suppuration at the point of infection, in other words, local suppuration and necrotic results. Cunningham, having shown that **chemical changes** are produced by micro-organisms in the fermentable matter lodged upon and between the **teeth,** and that such bacteria play by far the chief rôle in the production

of **dental caries,** rightly insists on the great importance of personal hygiene as applied to the teeth.

As is well known, one or two oral bacteria possess the power of converting starch into sugar, the majority are able to invert cane sugar into levulose and dextrose, and a large number are capable of changing sugar into lactic acid ($C_6H_{12}O_6$ grape sugar $= 2C_3H_6O_3$ lactic acid).

Carbon dioxide, hydrogen, formic, butyric, and acetic acids are also formed in the mouth by bacterial action. Of all these chemical processes, it is probable that the production of lactic acid is of chief pathological and etiological importance. Dental surgeons believe that these acid contaminations of the buccal cavity of bacterial origin, and especially the lactic acid, bring about decalcification of the teeth, while the animal part of the dental framework is afterwards dissolved by virtue of the peptonising power which certain buccal and other micro-organisms are known to possess.

In a series of admirable and exhaustive papers read before the British Laryngological and the British Medical Associations, Macintyre of Glasgow has rendered great service to the science of bacteriology in general, and added a vast amount to our knowledge of the special subject of micro-organisms which are found in the air-passages. He proves that the oral cavity is the gathering-place and **incubator** of certain varieties of pathogenic bacteria, so that many diseases, if traced to their source, will be found to originate in the mouth and upper air-passages. Among the maladies which have been traced to this source may be mentioned, besides dental caries, stomatitis, thrush, aphtha. herpes labialis, pneumonia, actinomycosis, noma, diphtheria, and tubercle, indeed, almost every form of pharyngeal, naso-pharyngeal, and laryngeal catarrh. The logical conclusion of Macintyre's observations would be to almost banish the word *catarrh* from our nomenclature; in any case it should in the future be used only in a generic and symptomatic sense.

The tendency of my own recent contributions, alike with those of Ruault and others, has been to bring a closer parallelism between bacteriological and clinical distinction in diseases of the throat, which may be considered pathologically identical; and Kanthack, in discussion of a recent paper, greatly enhanced the value of the original communication by his very original and pertinent illustrations. Thus, he cited cases of acute tonsillitis in which streptococcus was present; gingivitis of staphylococcal origin; œdema glottidis, and pneumonia with Fränkel's pneumo-

coccus; and phlegmonous inflammation in the neck, in which streptococci were found. Though identical in the histological features and morbid anatomy, they were entirely distinct bacteriologically.

Macintyre remarks that 'if anyone takes the trouble to scrape a little of the mucus from the lining of the nostril or the mouth in an apparently healthy subject, a great variety of micro-organisms will be found.' It is not stated precisely from what part of the nasal tract the 'scrapings' were taken, but this is not unimportant, as there are certain **structural differences** between the lining of the vestibule and that of the nasal fossæ. The former is lined with skin and provided with vibrissæ, whilst the nasal cavity is lined by the pituitary mucous membrane, and the lower or respiratory portion being further differentiated by the presence of ciliated epithelium. This membrane is provided with many muciparous glands, and is thus kept continually moist and glutinous by the viscid and tenacious mucus secreted therefrom.

St. Clair Thomson and Hewlett have reported that cultures made from the vestibule and vibrissæ always show abundant growth; whereas, in 84 per cent. of those inoculations made from the mucous lining of the anterior part of the nasal fossæ, such as the septum or inferior turbinal, barren results proved that there was absolutely no microbial growth whatever. The same observers express the opinion that the presence of pathogenic microbes in the pituitary membrane is quite exceptional.

But in point of fact this is exactly the result which would be expected, and the circumstance that 84 per cent. of the inoculations were sterile, proves how carefully the normal respiratory avenue is guarded; for these investigators intentionally avoided the very structures provided by nature to prevent microbes from entering. When one speaks, as was done on that occasion, of the harmful influence of nasal douches, after operations on the naso-pharynx, in setting up septic conditions, it is forgotten that by this procedure the normal function of retaining the germs by the vibrissæ is overcome by the avalanche of fluid that forces the germs, blood, and other septic products into the Eustachian tube, and thus into the middle ear. Indeed, the whole communication is useful, mainly, as confirmatory by somewhat crude bacteriological methods, of what throat specialists have for many years been enforcing as the result of clinical observation, namely, the absolute importance of a free ventilation by the nose as the first avenue to the respiratory passages, and the removal of all causes conducive to mouth-breathing.

However, not only are micro-organisms arrested in the nares by the mechanical action of the vibrissæ and mucus, but the mucus possesses in addition a **germicidal**, or, at least, an inhibitory action; this has been proved by Wurtz and Lermoyez, who state that nasal mucus, in three hours at 38° C., destroys almost all varieties of microbes, and even the spores of anthrax. It is certain, therefore, that in the majority of cases, pathogenic organisms which are carried into the bronchial tubes and pulmonary alveoli, find their way by the mouth and not by the nose. A clinical illustration may be seen in the fact that children who are the subject of bronchitis will almost invariably be found to have enlarged faucial or pharyngeal tonsils, or both.

A number of pathogenic bacteria appear to be able to live for a considerable time in the mouth without producing morbid change, as for instance the microbes of croupous pneumonia, diphtheria, and tubercle; the last-named has, in addition, been found by Strauss in the nostrils of healthy individuals living in contact with tuberculous patients, whilst Braidwood and Vacher have isolated from the nasal mucus of patients suffering from measles, the same bacillus as they found in their blood.

Why these organisms do not always cause pathological conditions, is no doubt materially due to phagocytosis, and to the further fact that the inflammatory changes which are often set up in the mucous membranes exercise a defensive action in the invaded regions.

It is interesting to note that the probable reason why phagocytosis in mouth-breathers is a failure, may be found in the circumstance that the subjects of nasal stenosis are always the subjects of anæmia. We know that phagocytic action is diminished in proportion to the decrease in the number of healthy leucocytes, and it is probable that quality as well as quantity may constitute an important factor in the defensive process.

CHAPTER XII

THE GENERAL ETIOLOGY AND PATHOLOGY OF NASAL AND NASO-PHARYNGEAL DISEASES.

The Nasal Mucous Membrane.

The nasal chambers are not only devoted to the sense of olfaction, but they are also the natural avenues through which the organs of respiration, audition, and voice production communicate with the air. When the nasal membrane is diseased, neighbouring portions of the respiratory tract are, as a consequence, more or less profoundly affected—(1) By direct extension of the morbid process to contiguous areas; (2) by abeyance of the function of warming, moistening, and filtering inspired air, in consequence of which the latter enters cold, dry, and loaded with foreign particles, thus conducing to disease of the pharynx, larynx, lower passages, and even lungs; and (3) by reflex induction of certain neuroses in adjacent correlated tracts. Under this last heading are included nasal cough, many forms of asthma, hay fever, nasal vertigo and allied conditions.

In order to thoroughly appreciate morbid conditions of the mucous lining, we must consider its function in the twofold directions:

Olfaction.—The sense of smell is dependent on a healthy condition of the olfactory and trigeminal nerves, on the due nutrition and moisture of the mucous membrane, and on the presentation of the odoriferous material to the olfactory region in a gaseous or finely particulate state. Graham started the hypothesis that olfaction consists essentially in an oxidising process of the odorous material within the nostril, and in the stimulant effect of that chemical process upon the sentient nerves of the olfactory region. This constitutes the theory of 'chemical action,' in contradistinction to the 'mechanical action,' as illustrated by the irritation consequent on the inhalation of ammonia, volatile acids, pollens, and tobacco snuff. This mechanical stimulation, however,

does not relate to the nerve of special sense, but is due to irritation of the terminal branches of the nerves of common sensation—the olfactory division of the fifth.

A view opposed to that of Graham is the vibratory theory, originally suggested by Dr. William Ogle, according to which, odorous impressions are considered to be the result of vibrations. Basing his view on the fact that pigment is present in the olfactory region and essential to perfect olfaction, much in the same way that luminous vibrations are absorbed by the choroidal pigment, Ogle, in an article on 'Anosmia,' brought together a number of facts to show that albino animals are deficient in pigment and in the sense of smell; as a consequence they die early, being handicapped in the struggle for existence by their inability to protect themselves against poisonous plants, dangerous inhalations, and insanitary habitations.

The part played by the olfactory region in the perception of flavours is well known: savoury meats and wines are really smelt, a fact which can be proved by plugging the anterior and posterior nares, and it is further confirmed by the constant association of want of perception of flavours with loss of smell.

Anosmia may be occasioned by several classes of lesions—First, by mechanical impediments to the admission of odorous molecules to the sentient surfaces. Amongst these causes may be named *polypi*, *rhinal calculi*, *congenital* or *cicatricial malformations* of the *nostrils*, *deviations* of the *septum*, *acute* and *chronic thickening* and *swelling* of the *membrane*, all leading to *stenosis*. Secondly, the function is impaired by all nutritive or destructive changes of the membrane, which lead to degeneration of the glands and nerve filaments. Under this heading come such destructive lesions as *atrophic rhinitis*, *strumous*, *syphilitic*, and other forms of *caries* and *necrosis*; disordered nutrition and loss of function are also occasionally directly associated with *paralysis* of the *trigeminal nerves*. And, thirdly, anosmia may result from various lesions causing *destruction* or *impaired* functions of the *olfactory nerves* in their continuity, as by *fractures* and *new growths*, or centrally by *disease* of the *olfactory lobes*, or other intracranial mischief. In all of these instances the lesion may be unilateral.

It remains to be added that the cause may occasionally be much less directly nasal, since cases are not uncommon in which one finds unilateral anosmia associated with defect or loss of sight, taste, hearing, and even cutaneous sensibility. These are generally transient, and are to be interpreted as functional. This is the probable explanation of the following:—

CASE IV.—I was consulted, in April 1879, by a lady, on account of loss of smell, for which I could find no reason beyond a chronic pharyngitis and a very relaxed uvula. For the relief of the pharyngeal trouble I reduced the lengthened uvula by abscission, with the somewhat unexpected result that the anosmia was entirely cured. Since that time I have seen other instances which have assured me that this experience was not unique.

Allusion has already been made to the intimate connection of the fifth pair of nerves with the sense of olfaction. These nerves doubtless preside over several separate functions, and contain distinct kinds of fibres for their due performance. Thus one set controls the amount and character of the glandular secretion; and another—the trophic fibres—presides over the nutrition of the part; whilst a third will respond to the stimuli of common sensation, and warn the lungs of the approach of irritating bodies and gases. Added to these may be mentioned the vaso-dilator fibres which are distributed with the same nerve.

It is not surprising, therefore, that olfaction should be impaired by anything which interferes with the due performance of these varied functions of the fifth nerve; and this is amply borne out by clinical experience, as will be seen when we come to consider the symptoms of various nasal diseases.

Respiration. — The respiratory region is marked by the presence of three important structures—glandular, erectile, and lymphoid tissue, each with its respective rôle.

The **glands,** as we have seen, are of two kinds, mucous and albuminous. The latter, which are identical with the true salivary glands in structure, are much larger and far more numerous than the former. There is, however, one feature about these glands which is of pathological interest, viz. that in the thicker areas of the mucous membrane, the alveoli, especially those near the surface, are filled by large and small globules of fatty matter, resembling that found in sebaceous and Meibomian glands. In ozæna the crusts and discharges usually contain decomposing fatty globules and micro-organisms; hence the offensive odour.

Klein describes fine bundles of muscular fibres as occurring in the inter-alveolar tissue of guinea-pigs and rabbits, and considers that their function is to aid in the discharge of the gland-contents; he, however, makes no allusion to similar structures in man.

John N. Mackenzie has shown that so long ago as 1769 Morgagni drew attention to the peculiar and 'red thicknesses of the membrane of the nose'; from his description he appears narrowly to have missed the discovery of the turbinated **erectile tissue.** Toynbee, in his *Diseases of the Ear*, says: 'Many years

ago I pointed out the peculiar *erectile tissue* of the nasal mucous membrane, not only in man, but in other mammalia; this tissue is a most efficient respirator.' In 1853, Kohlrausch injected the tissue from the jugular vein, and looked on it as a '*cavernous network of veins* just underneath the mucous layer.' Such a plexus had been previously referred to by Hyrtl, and was subsequently claimed as an independent discovery by Kölliker. Kohlrausch evidently mistook the erectile spaces for venous trunks, and failed to appreciate the true contractile or erectile character of the tissue, which was subsequently set forth by Bigelow in 1875. This last-named observer, in an article familiar to all specialists, described the tissue with great accuracy, and defined its limits. Bigelow was the first to observe the alternate distension and collapse of the erectile bodies, thereby leading the way to the rational interpretation of nasal affections. From their resemblance to the cavernous structures of the penis, he gave them the name of the *turbinated corpora cavernosa*; Zuckerkandl has pointed out that they may with more propriety be classed amongst the erectile tissues. At the International Medical Congress in 1881, Bosworth described the tortuous condition of the arteries of the turbinated bodies, the so-called *helicine arteries*; and he also drew attention to the fact that in hypertrophy of the turbinated mucous membrane there is overgrowth of the surface layer, of the adenoid layer, of the racemose glands, and of the connective tissue between the enlarged vascular sinuses.

In a more recent contribution Bosworth has denied the erectile nature of 'the true erectile tissue' of Bigelow, to which he formerly subscribed. He believes that nasal serosity is largely due to exosmosis direct from the vascular tissue, and not to glandular mechanism. Such exosmosis from the small capillaries may occur, but it must be an insignificant factor in the production of the rhinal fluids, except as a morbid process (rhinorrhœa).

Underneath the basement membrane are found masses of adenoid tissue, more or less diffuse. These collections of lymphoid tissue form a potential *nasal tonsil*, whose function is doubtless to secrete serum and leucocytes for scavengering purposes, into the rhinal passages, a function which is usually believed to be the exclusive function of the mucous and serous glands. Bosworth makes the extraordinary statement that in the nasal mucosa 'there are no serous glands,' whereas, as has been remarked above, the serous glands are both larger and more numerous than the mucous.

In this matter modern works on physiology are somewhat

behind the times, for mention is not made of what anyone will readily make out who takes the trouble to remove and examine microscopically a portion of the membrane covering the inferior turbinated bone, namely, an erectile tissue of venous sinuses and fibro-muscular trabeculæ, homologous with the corpora-cavernosa of the penis. This layer of erectile tissue is limited principally to the respiratory portion of the nose—that is, to the lower and posterior parts of the inferior turbinated bodies; but it is also to be found in the deepest layers of the mucosa covering the superior and middle turbinals; it is, however, on the inferior turbinal that it attains its greatest development. The veins from these sinuses pass in five different directions, viz. to the plexuses of the face, cranium, orbit, soft and hard palate.

No good purpose would be served by a recapitulation of the sizes and shapes of cells and other details, which have no very important bearing on etiological and pathological considerations; but it is necessary to dwell, albeit briefly, on the normal physiological functions of the respiratory region.

The nostrils, in the first place, offer a double aperture for the admission of air; floating dust and coarse particles are caught by the vibrissæ of hairs which keep sentinel at the entrance; the moist and ciliated mucous lining is eminently adapted by its irregular contour and its vibratile cilia to catch any finer particles which, on being deposited, act as stimuli to the glands; as a result, a secretion is poured out which veritably flushes the nasal passages. The cilia, however, work in the direction of the naso-pharynx; it is therefore probable that in health the secretion of the nasal glands is carried to the throat, and there either re-absorbed or swallowed; when the balance between secretion and its physiological removal by backward ciliary action is interfered with, as in acute catarrh, a running from the nostrils results. It will be seen, therefore, that the cilia in the respiratory tracts of the nose have a very definite and important function to perform, viz. the removal of mucus and of foreign bodies deposited on the surface from the inspired air. If these cilia are destroyed, this function ceases, and, as a consequence, a chronic inflammation results, with all its train of evils in the way of hypertrophies and hypersecretions; atrophy, with arrested or perverted secretion; polypi, etc. It is my conviction that destruction of the cilia is often the first pathological change in a chronic catarrh, and this is confirmed by the microscopic observation that in nearly all cases of chronic irritation the ciliated cells are replaced by stratified squames; on this basis one readily recognises the evils of snuff-taking and

tobacco, of alcoholic fumes, and also of medicated inhalations of a pungent or irritant character.

In all probability, however, by far the most important function of the nostril is, not to simply filter the air from dust, but to warm and moisten it. Morell Mackenzie alludes to some experiments which tend to prove this point; and more recently Aschenbrandt has, in the physiological laboratory of Professor Fick, at Würzburg, conducted some more accurate investigations in the same direction. His method was to estimate the difference between the temperature and moisture of air passed by a glass tube through the mouth to the posterior nares, thence through the nasal fossæ to the anterior nares. These experiments conclusively prove that almost the whole of the brunt of moistening and warming the inspired air is borne by the nose during normal breathing. There can be no doubt that the complexity and freedom of the vascular and glandular supply of the nasal fossæ in health are well adapted for the thorough carrying out of this function. Even in mouth-breathers, and in those obliged to respire through a tracheotomy tube, the expired air is always hotter and moister than the inspired, and it stands to reason that the lungs must in such cases *lose heat*—(1) by conduction, whenever the temperature of inspired air is less than blood-heat; and (2) by *evaporation of water* from the lungs, on account of the low vapour tension, due to the fact that the air has not been moistened in the nose. This state of affairs, which exists whenever there is blocking of the nostrils or of the naso-pharynx, necessarily acts prejudicially on the lower air-passages in particular, as well as on the organism at large.

Bloch's investigations on nasal respiration led him to formulate certain conclusions, all of them interesting, but not all perhaps quite conforming to the demands of modern physiology:—

1. The temperature of the inspired air is considerably raised while passing through the nasal cavities, the expired air being 1·5° to 2° C. higher after nasal respiration.
2. The thermogenic action of the nasal mucosa is relatively greater when the surrounding temperature is lower than that of the body.
3. The thermogenic action of the buccal cavity is slight, compared with that of the nasal.
4. The heat given up by the mucosa of the nose (and its diverticula) at each inspiration, and at a moderate external temperature, is equivalent to 6 gramme-calorics.

5. Inspired air passes out of the nose about $\frac{2}{3}$ saturated. (Keyser and Aschenbrandt, however, maintain that it passes out *fully* saturated with moisture.)

   Parenthetically, it may be noted also that analysis of the air respired through a tracheotomy tube has demonstrated that the bulk of saturation is derived from the lungs.

6. The nose, though not a perfect filter of dust, retains the greater part of the solid particles inspired; the amount filtered depending on the viscidity of the mucosa, and the weight, size, and hygroscopic properties of the solid matter inhaled.

7. During normal nasal respiration the tongue is pressed against the palate and the mouth is kept closed, both anteriorly and posteriorly, solely by the pressure of the external air.

8. Every *considerable* mechanical, chemical, or thermic stimulus acting upon the nasal mucous membrane, through the inspiratory air current, induces an immediate cessation of the respiratory act. This respiratory standstill is immediately succeeded by an inspiration. It is probable that weak stimuli retard inspiration, and that very strong stimuli induce an immediate expiratory effort.

The function of the **Nose in Voice Production** has already been frequently alluded to, but a few words of recapitulation will here be useful. Voice is due to the vibrations of a column of air passing up from the lungs, through the larynx, to the mouth and nose; the *pitch* of the voice is regulated by the tension and approximation of the vocal cords, the *volume* by the force of the pulmonary blast through the glottis, while *tone* is dependent on the shape of the oral, nasal, and pharyngeal cavities, and on the movements of the palate and pillars of the fauces. Articulate language depends, in addition, on movements of the palate, tongue, cheeks, and lips. In uttering the vowel sounds, the nasal cavity is shut off from the mouth by the soft palate, whilst the velum is relaxed in forming such letters as *m* and *n*, which are said to possess a nasal twang. Helmholtz has shown that the fundamental note originating from vibrations of the vocal cords gives rise to a series of secondary vibrations of the current of air in the nasal cavities, which over-tones serve to reinforce the harmonics of the voice and add to their quality. Phonation and articulation are therefore not only impaired in the

victims of nasal obstruction, but in this condition singing in the falsetto register is impossible.

From what has been said, it will be seen that in the discharge of their respiratory function the nasal passages are constantly exposed to ever-changing atmospheric conditions of heat and cold, dryness and moisture. The amount of its blood-supply and glandular secretion will therefore vary with every barometric fluctuation, with every breeze that blows, and with every vitiating influence of the atmosphere: In order that the membrane may from time to time adapt itself to these ever-varying circumstances, it is evident that a sensitive and regulating nervous mechanism will be required to correlate and control the activity of the glandular and vascular supply. Such a mechanism evidently does exist in connection with the spheno-palatine ganglion and the fifth pair of nerves. The sensitiveness of this area is beyond all question; for the nasal lining readily responds to direct stimuli, whether mechanical, chemical, galvanic, or thermal; the immediate effect is usually a blanching of the membrane, to be followed, according to the nature and duration of the stimulus, by a more or less obvious congestion and swelling of the erectile structures and by an increased secretion.

This congestion or erection of the vascular portion of the membrane generally, and of the turbinated corpora cavernosa in particular, with accompanying hyper-secretion, is the condition *temporarily* met with in every ordinary catarrh, and *permanently* established in the swollen state of the membrane known as *rhinitis hypertrophica.* Seiler, John Mackenzie, and other Americans, and, more recently, Continental workers, have shown that the fully established hypertrophic condition is the final result of constantly recurring abnormal dilations of the turbinated cavernous spaces and other vascular sites in the nose. It must not, however, be assumed that the stimuli necessary for this erection need be applied directly to the interior of the nostril, for a number of experimental and clinical data clearly show that this is much too narrow a view. Mechanical irritation, as from particles of snuff, the pollen of grasses and other flowers, fine dust, etc., is almost as important a factor in the production of turbinal distension as changes in the temperature of the atmosphere; and if long continued, will certainly lead to a permanently enlarged, swollen, and hypertrophied condition of the erectile tissue and mucous membrane generally; but this state of affairs can be brought about in quite a different manner than by direct stimulation of the membrane producing reflex erection. Woakes,

who is most enthusiastic on this question of correlated action, has drawn attention to a number of examples of peculiar reflex functions of the nervous system which obtain in connection with organs supplied by the cervical division of the sympathetic system. To take a simple example: in passing a Eustachian catheter, one often notices, amongst other things, excessive lachrymation. In this case, clearly the nasal membrane is in nervous connection with the tear gland reflex through the first and second divisions of the fifth. Conversely a flash of light will cause sneezing. Stimulation of one spot produces vasomotor dilatation of the vessels of another. This is because the nervous mechanisms of the two areas are correlated and intimately connected, which connection, however, is usually only rendered evident under the influence of some exceptional or powerful stimulus. In the example quoted, the two correlated areas, although only a few inches apart, are really no more closely related reflexly than are the apparently independent structures of the breast and organs of generation. Thus one is free to appreciate the remarkable essay by John Mackenzie, to which allusion has already been made, on 'Irritation of the Sexual Apparatus as an Etiological Factor in the Production of Nasal Disease.' This author calls attention to the intimate physiological relationship existing between the nasal and reproductive apparatus, which is partially explained by the theory of reflex or correlated action, partially by the bond of union which exists between the various erectile structures of the body. He draws attention to the fact that in a certain proportion of women with healthy nasal organs, engorgement of the turbinated corpora cavernosa occurs regularly at each menstrual flow. This is physiological sympathy.

Clinically there are some facts which appear to lend support to this view, for it is often noted, if due inquiries be made, that nasal affections become much more troublesome at the menstrual epoch; the symptoms are aggravated, and in ozæna the discharge is decidedly more fœtid. Of this fact I have long been cognisant in my own practice. Again, epistaxis in boys and girls at puberty, and vicarious nasal menstruation, are quite in accordance with the same hypothesis. There are some who always suffer from coryza after a venereal debauch; and nasal diseases are constantly aggravated by sexual excesses. It is probable that the same fact obtains in connection with masturbation. Finally, it is quite possible 'that congestion of the nasal erectile tissue precedes, or is the excitant of, the olfactory impression that forms

the connecting link between the sense of smell and erethism of the reproductive organs exhibited in the lower animals.' That a relationship exists, by virtue of which irritation of the genital organs reacts upon the circulation and nutrition of the nose, is therefore rendered highly probable by the evidence of clinical investigation.

If this excitation of the nasal membrane be carried beyond its physiological limits, there comes a time sooner or later when that which is a normal process becomes a pathological one, according to a well-known law of the economy. It is in this way that various stimuli, whether applied directly within the nostrils or reflexly through the nervous system, bring about in course of time chronic congestion and disordered nutrition of the nasal membrane, leading to general swelling and proliferation of the constituent elements and of the turbinated bodies; in point of fact, to one or more of the conditions known as *hypertrophic rhinitis.*

On the other hand, congestion and hypertrophy may, after a longer or shorter time of perverted growth and secretion, lead to an increase of the connective tissue elements of the membrane; these ultimately contract and culminate in fibroid shrinking and in atrophy of both membrane and bone. *Chronic atrophic rhinitis* is thus established, the ciliated epithelium is lost, the viscid and opaque secretion cannot be swept away by the ciliary action, microbic growth and decomposition occur, and ozæna is the final result. But it is not always true that *rhinitis hypertrophica* gives place to the atrophic state, nor, conversely, is it a fact that *atrophic rhinitis* is *always* a result of hypertrophy, though such is generally considered to be the more usual sequence of events. Occasionally atrophy is the chief factor from the commencement; but the precise mechanism and set of causes which tend to bring about this condition without previous hypertrophy has till recently been ill understood, and yet requires further elucidation. Bosworth's suggestion that it is due to drying and retention of the mucus on the surface, since it does not explain such antecedents as loss of cilia and altered secretion, is inadequate. It is a question worthy of consideration whether in some cases of so-called atrophic rhinitis, and especially those in which there is abnormal smallness of turbinated bone, there has ever really been a proper development in the first instance, and whether the condition does not represent a consequent inability of the tissues to peform their natural functions. These remarks apply more particularly to that form of the disease known as *strumous ozæna*, which, commencing at six or seven years of age, occasionally manifests improve-

ment at the period of puberty, or in the female sex after marriage.

Hypertrophy of the nasal mucous membrane, instead of resulting only in general thickening, which is most prominent on the tubercle of the septum, and on the turbinal bodies, may show further evidences of disordered nutrition and growth, in the shape of defined *hyperplasiæ* and distinct *neoplasms*.

It is beyond the scope of this chapter to go into the whole question of the etiology and pathological histology of nasal polypi; but it may be briefly stated that they are exuberant growths, containing in a greater or smaller proportion the elements of the mucous membrane from which they spring. Chronic inflammation and *ab extra* irritation seem the most potent factors in their etiology. The situation of true polypi indicates that they often originate as a circumscribed *œdema* of pendulous portions of the mucous membrane. My own experience tends toward support of the view that a *polypoid diathesis* may be a factor of importance.

CASES.—I have seen two cases in which nasal polypi were associated with laryngeal growths; and others in which there were warty growths on the uvula or some other portion of the soft palate. I have also been told by patients with nasal polypi that they have suffered from similar neoplasms which have required surgical treatment in the uterus and rectum. Lastly, I have removed a very large polypus blocking up the whole of the right nostril, and dropping back into the post-nasal space, so that it could be seen by oral examination. The growth had probably commenced about three years previously, and, at about the same period, the patient, a young lady, then eighteen years of age, noticed several little pendulous warts forming on the right side of the neck, and limited to that situation.

And allied to this question is that of heredity of nasal polypi, and of family predisposition to nasal hyperplasiæ. Of this circumstance I can recall several instances:

CASES.—I have operated on three brothers in one family for nasal poylpi; have treated a young lady for nasal polypus, whose mother has also a similar growth—never operated on—which is, I believe, the chief cause of her chronic bronchitis; and yet again I have removed a polypus from a lady, æt. 51, who had yet a closer family history in the same direction. Her mother was the subject of an enormous polypus, which would protrude from the nostril and could be pushed back into the throat. It was never removed, and the subject of it died suddenly with symptoms of suffocation. The mother of this last-named lady had also polypus, and her father's brother was similarly afflicted.

We have seen that the circulation and nutrition of the nasal membrane is capable of being affected reflexly by stimulation of such a distant portion of the body as the generative organs, and conversely we should expect to find that stimulation or irritation of the nasal membrane would cause reflex effects elsewhere. The simple experiment of passing a catheter or probe into the nose,

to which I previously alluded, as causing, amongst other things, sneezing and lachrymation, is ample proof that such is the case. But there are a number, and a continually increasing number, of clinical data which support the view that the presence of nasal polypi, hypertrophied turbinated tissues and foreign bodies in the nose is intimately connected, if not the actual cause of various asthmatic symptoms. W. H. Daly, Roe, Häck, John Mackenzie, and myself have all reported cases of asthma, hay fever, and rose fever, which were cured by simply treating the diseased nasal membrane; but the first to point out the fact of the connection was Voltolini.

Predborski has recorded a case of a young Jewess who suffered from *aphonia*, accompanied by paroxysms of dyspnœa, one of which was so alarming that tracheotomy was contemplated. The nose showed redness and tumefaction of the turbinated areas; touching them produced pain, sneezing, and mucous discharge. Chromic acid cauterisation cured the nasal affection and the reflex neurotic manifestation. Here there was evidence of correlation between two different portions of the respiratory apparatus, namely, the nasal and laryngeal. In those forms of asthma, the exciting cause of which is to be traced to nasal disease, the correlated tract is somewhat lower down, namely, in the trachea and bronchi, as indicated by the characteristic spasms.

Nasal Cough-Spots.—The fact that cough often ensues on touching the nasal mucous membrane by probes, catheters, and instruments used for diagnostic purposes, led John Mackenzie to conclude that many cases of cough might be of a nasal reflex character; he accordingly conducted a series of experiments with a view of testing the sensibility and relative irritability of the nasal lining in health and disease. As a result of these investigations, he concludes that there exists a well-defined sensitive area situated near the posterior extremity of the inferior turbinated bone and contiguous portion of the septum; stimulation of this area, either through a local pathological process or through the action of an irritant introduced from without, is 'capable of producing an excitation which finds its expression in a reflex act, or series of reflected phenomena, of which the most common is nasal cough.' Häck, however, considers that the most sensitive region is the anterior portion of the inferior meatus. Since the earlier edition I have had under my care a large number of cases of hyperæsthetic rhinitis (hay fever and pseudo hay fever), in which the characteristic symptoms subsided on the removal by the nasal saw or trephine of prominent sensitive spurs at the anterior part of the

septum. In health this area only responds to some abnormal irritation, and its function is doubtless to warn the lower respiratory region of the approach of dangerous gases or other injurious agents. When, therefore, we are dealing with cases of cough, aphonia, laryngeal spasm, and asthma, it is our duty not only to examine the lungs and larynx in seeking for the cause of the symptom, but we must also explore the naso-pharynx and nares. And in case no obvious cause is found in these regions, we must not forget to include the ear in our investigation. I have seen cases in which simple impaction of wax was the cause of distressing laryngeal symptoms.

Epileptiform neuroses, including vertigo, which we have already considered in relation to the larynx, occasionally, but more rarely, occur in connection with nasal disease. In the case of Mr. T., which will be found recorded in Chapter XXVIII., a pinch of snuff, taken four or five years previously to my seeing him, had had the effect of causing him 'to drop down dead on the floor in a minute.' This had occurred once before in early life; but he had forgotten it on the second occasion, until the circumstance of its repetition forcibly recalled it to his memory. Cases of nasal polypi causing this symptom are comparatively rare; but an Italian author, De Gennaro, has reported one.

Bobone, of Prazzi, has also lately called attention to the case of a patient who suffered periodically from spasmodic attacks of sneezing of a most violent nature; on two occasions the attacks of sneezing followed so rapidly that the patient became cyanosed and collapsed, and almost died. With the supervention of vertigo, the attack was cut short. Examination of the nose showed a hypertrophic condition of the mucous membrane. The reflex symptoms disappeared on treating this, the local disease.

Here, no doubt, a reflex spasm of the glottis leads to vertigo, in the way to be later explained when speaking of the laryngeal analogue. Allusion has already been made to naso-pharyngeal catarrh as a predisposing cause of laryngismus stridulus, and the rationale of the connection is afforded by reflex as well as by direct causes.

A case of epilepsy, which was said to have been cured by treatment of a co-existent nasal affection, lately came under my notice. Richardson and others have also reported similar examples. In most of these instances, antecedent epileptic proclivities were probably aggravated by the supervention of nasal irritation, and the cure of the latter merely removed a prominent exciting cause of the former; but others are very possibly analogous to the epileptiform seizures associated with laryngeal

spasm. I have further knowledge of at least three cases of mania occurring in connection with nasal polypus. In one, removal of the growth was followed by direct relief of the mental disorder, and the patient was discharged from the asylum to which he had been removed. This occurred in the practice of my colleague, Dr. Orwin, and several others have happened in my own experience. In addition to the foregoing neuroses, which are now generally recognised by specialists in this country and America as fairly often of nasal origin, there are others to which attention has been drawn by Continental observers, in a manner that may appear to savour of exaggeration. Thus Häck believes that megrim, supra-orbital neuralgia, diffuse headache, œdematous conditions of the nose and conjunctivæ, are almost *invariably nasal in origin*, and can be cured by galvano-caustic applications to the turbinated bodies.

The following example bears on these points :—

CASE V.—Mrs. A., æt. 51, consulted me, 25th April 1887, on account of intense occipital headache which extended to the shoulders, and was accompanied by a sensation of extreme cerebral fulness and pressure, and constant drowsiness. This condition had existed for four years, and had been exaggerated at the menstrual periods; but though the catamenia had now ceased for a year, exacerbation still occurred at regularly recurring monthly epochs. I should have been inclined to set down these symptoms as neurosal complications connected with the menopause, but that the patient reported also that for ten years she had been unable to blow the left nostril, that she had a feeling of numbness over the region of the nose, and that for the same period she had experienced great oppression whenever she was in a hot room, which was always relieved on her going into the open air. On examining the left nostril, multiple polypi were discovered in the middle meatus. These were removed, and the cautery afterwards applied. As a result, all the head symptoms were relieved with a promptness and completeness that is hardly credible.

Sommerbrodt, Heryng, Fränkel, Schäfer, and Baratoux have reported cases in support of Häck's views. The first two give instances of spasm of the glottis, which may be placed in the same category; while Heryng and Jacobi hold that some examples of chorea should be likewise included. Bosworth takes an even more pronounced view than the observers whom I have quoted, and goes the length of saying 'that during the last four years he has seen no single case of spasmodic asthma in which the source of the disease could not be traced to the existence of some disease in the nasal cavity'; while in another recent contribution he will acknowledge no form of catarrhal laryngitis except as a result of nasal disease, and this not by continuity of tissue.

Farquhar Matheson has drawn attention to the fact that stammering and stuttering frequently result reflexly from irritation

in the nose and naso-pharynx. My personal experience confirms this connection.

In addition to headache, which all rhinologists have been long familiar with in connection with nasal catarrh and stenosis, Guye, of Amsterdam, several years ago described another frequent symptom, namely, a condition of inability to fix the attention and a hampering of the cerebral functions, which is especially marked in children with naso-pharyngeal obstructions. Guye has given the name of *aprosexia* to this condition, so common in the supposed victims of 'over-pressure.' His observations have been amply confirmed, especially as regards the disappearance of aprosexia on the removal of adenoid growths and enlarged faucial tonsils; while Hill has found that lymphoid tonsillar obstructions of the nose and throat are very prominent in the aprosexic, backward, and idiotic children in Earlswood Asylum. Attention has also been called to derangement of temper, energy, spirits, and intellectual power in connection with the same stenotic conditions. It is believed that aprosexia is due to lymph and venous obstruction in the intra-cranial structures, especially in the frontal lobes, from the pressure of lymphoid hypertrophies in the nose and pharynx.

So early as 1881, Guye mentions that Professor Snellen, struck by the frequent coincidence of the so-called *follicular conjunctivitis* with nasal and pharyngeal adenoid vegetations, thought it likely that the diseased state of the nasal mucosa might have an influence on the conjunctiva, either by producing irritation and lachrymation of the eye by reflex action, or perhaps through the direct connection of the lymphatic systems of both mucous membranes. Acting on this view, he had advised a young lady, aged fifteen, who, suffering from both these conditions, consulted him on account of her eyes, to undergo treatment for her throat and nose at the hands of Dr. Guye, prognosticating that, when these were cured, the eyes would get all right of themselves. Guye was sceptical of this prediction, but in the result its correctness was proved.

Cheatham, of Louisville, has reported several cases of *diseases of the eye*, which he considered due to nasal reflex, and which have only been cured after successful treatment of the concomitant nasal lesion. This observer also states that 'certain cases of glaucoma have been relieved by stretching the nasal branch of the fifth nerve, and these cases might not improbably be the result of chronic nasal disease.' The following case in my practice is confirmatory of the suggestion:—

CASE VI.—Mrs. D., æt. 30, from Canada, when consulting me in the spring of 1885 regarding her daughter, told me that she herself was suffering from severe and increasing glaucoma, for which she had had the best advice in the Metropolis and on the Continent. Iridectomy had been performed on one eye, but without benefit. The pain was so intense that she was almost constantly applying cocaine, to an extent that was seriously injuring her health. Early in 1886 this lady was attacked with double pneumonia, followed by asthma, for which she was treated in my absence from home by my colleague, Dr. Percy Jakins. On recovery it was found that she was suffering from polypi in both nostrils; these I completely eradicated, after some ten or twelve sittings. In July 1886 she left England to reside in Jersey, and I did not see her again until May 1887. I was gratified to find that not only were her nostrils free from recurrence of the growth, and that she had had no return of her asthma, but that her eyes were entirely free from pain, and that her sight had greatly improved. This change in her ocular symptoms had taken place without any further treatment of the eyes, and, as she herself suggested, had dated from the cure of her nasal disease.

A valuable contribution has since then been made on this subject of the connection of some eye affections with nasal disease, by Bronner, who, as practising rhinology as well as ophthalmology at a large hospital, is well qualified to form a correct opinion as to the prevalence of this connection. According to this observer, hypertrophic rhinitis and other abnormal conditions of the nasal mucosa proper (*i.e.* excluding the lining of the sinuses) are frequent antecedents of epiphora, mucocele, inflammation of the conjunctiva and cornea, ulceration of these same parts, granular lids, muscular asthenopia, and glaucoma. Many of these symptoms are due to stenosis, partial or complete, of the nasal duct. Suppurative catarrh of, and growths in, the antrum may in some cases cause dimness of vision and contracted field, orbital neuralgia, and glaucoma. That empyema and growths of the frontal sinuses may result in orbital symptoms, has long been recognised on account of proximity. Some of these ocular and orbital complications of rhinal lesions are due to obstruction of the nasal duct, others to venous stagnation and congestion, others to abnormal reflexes. Of thirty-eight cases of mucocele reported by Gruhn and thirty-five by Faravelli de Kruch, the nose was also affected in thirty-six and thirty cases respectively. Ziem has drawn attention to the fact that in most cases of granular lids there is also rhinitis, and believes the nasal lesion to be causal rather than casual.

I have heard it stated by ophthalmic surgeons that this intimate relationship of diseases of the eye and nose has been grossly exaggerated by rhinologists, but now that their attention has been drawn to it by so many independent observers, and especially by so distinguished an English specialist as Henry Power, it behoves them to examine the nares in all those affections of the eye in which nasal disease is asserted to be even an occasional

factor of causation. Indeed, until quite recently the position taken by the generality of oculists on this question has borne strong analogy to that assumed many years since by general physicians, when the question of a primary pharyngeal or laryngeal tuberculosis was first mooted. The truth of such a circumstance, then denied, is now no longer disputed, even by those unfamiliar with the laryngoscope. And there already exists strong evidence, in the shape of reciprocal consultations, of a still closer co-operation between the rhinologist and the ophthalmologist.

The question naturally arises—Is an abnormal state of the nasal mucous membrane a *frequent* or only an *occasional factor* of these numerous and varied maladies? Before answering this question, we must decide whether the fact of relief or cure by galvano-caustic applications *necessarily* implies that in the nasal condition we have a universal *fons et origo malorum*. Are not neurotic disturbances often benefited by strong counter-irritation, applied at the most diverse sites? McBride, taking this line of argument, goes so far as to say that a galvano-caustic application to a healthy nasal membrane 'may act just as a counter-irritant of equal severity applied to another part of the body'; this view is, however, not justified by fact, and at best represents but half the truth.

Reviewing all the facts, we must acknowledge that in many instances asthma and other neuroses are excited by nasal lesions, and can be cured by galvano-cautery or other appropriate, and not necessarily caustic, intra-nasal therapeutic agents. It is possible also that in a few instances galvano-caustic applications to the nose may relieve neurotic symptoms, not of direct nasal origin, by reflex inhibitory action, even where there is no marked nasal abnormality. But while personally inclined to agree with the view that a certain proportion of cases of asthma, megrim, epilepsy, and allied conditions, unassociated with *obvious* nasal lesions, may be cured by intra-nasal treatment, I am bound to say that in my own practice I have seen not a few instances of asthma, etc., which were apparently a direct result of existing nasal polypi, but in which the neurotic symptoms have continued in spite of complete restoration to health of the nasal mucous membrane. In such a case it is fair to suppose that, although the peripheral nasal lesion was apparently an exciting agent of respiratory disturbance, the real disease was central in its origin, and probably due to lowered resistance or increased excitability of the basal ganglia. In other words, asthma is not in itself a nasal disease, although it may exhibit nasal complications, and

may sometimes yield to intra-nasal treatment. Schmiegelow, of Copenhagen, in a recent work of great merit, lays down some good rules with regard to the connection of the asthmatic phenomenon with the nose, which, on the whole, have been found to accord with my own experience. The connection may be assumed —(1) When the clinical picture leads to the belief that the abnormal condition of the nasal cavities is a factor in the production of the asthmatic attack, which is to be inferred when the asthmatic symptoms occur, or are aggravated with any increase in the nasal symptoms; (2) when local treatment, such as pencilling the nose with cocaine, the introduction of tampons of cocaine or menthol arrest the symptoms, or local treatment gives immediate relief; (3) when the careful treatment of peripheral irritation, due to a chronic nasal catarrh, definitely checks the asthmatic attack. At the same time, as Schmiegelow very properly remarks, 'nasal diseases may accidentally accompany cases of asthma without having any etiological connection with the asthmatic attacks.' It is best always to be very reserved in expressing anything to the patient as regards the influence local treatment may have upon the asthmatic attacks. Where the clinical picture gives us decided belief in a causal connection between the nose and the asthmatic phenomena, 'it is in these cases only when the patient himself wishes it, after he has vainly tried every other treatment, that one ought to begin the rhino-surgical treatment; but the result will probably be negative with regard to the asthma, though it may otherwise do the patient some good by curing his nose.' An anonymous reviewer of this author's volume pertinently adds that only by carefully selecting the patients upon whom rhino-surgical treatment is really likely to be of service, shall we avoid the discredit of 'meddlesome surgery' and the reproach of Kurz, that in asthma one has to do with a real sufferer who is not merely an appendix to his nose.

It would serve no good purpose to enter at greater length into the varied reflex phenomena connected with either hyperæsthesia, hypertrophy, or hyper-stimulation of the nasal membrane; but it is interesting to note that the *nasal reflex* has already been made use of in testing the local sensory action of drugs. Into one nostril of a frog the solution of the drug is introduced drop by drop, at intervals of a few minutes; the nasal reflex is then tested by passing a very light wire into the medicated nostril, and comparing it with the fellow of the opposite side. Irritation of this, the sound side, will cause a frog to blink, wince, and make efforts to remove the offending body.

This method, which has been used to determine the local differences between caffeine and theine, is very accurate and delicate; and the very nature of these experiments suggests the appropriate remedy for hyperæsthetic conditions of the pituitary membrane. From the first introduction of cocaine, I employed it for the relief of nasal reflexes, in common with many other surgeons, though the effect of the drug is not *always* anodyne. In my own person, cocaine applied to the nostril produces spasm, cough, and nausea. We have now alternatives in eucaine and holocaine.

The Accessory Cavities.—The maxillary, ethmoidal, frontal, and sphenoidal sinuses require to be taken into account in studying nasal diseases. These cavities communicate by small openings with the nasal fossæ, and are lined by a mucous membrane similar in structure to that covering the respiratory area. *They probably serve as* **reservoirs** *of warm and moist air*, and thus aid in the respiratory function; doubtless, however, their original *raison d'être* was to afford lightness to the bony structures of the face. When their openings into the nasal fossæ are blocked by either acute or chronic swelling of the membrane or by other mechanical causes, a retention of secretion results, which may end in abscess, or may lead to a persisting suppurative condition of the lining. I have long been in the habit of pointing out that *one-sided ozæna is most frequently due* to this circumstance, and published record of the fact is to be found so far back as 1879. Suppuration of the accessory cavities, especially of the antrum, is not, however, always of catarrhal origin, and is frequently connected with other causes, such as dental mischief, caries of a surrounding portion of bone, a missile, or other foreign body. It would appear to be a more frequent complication or sequel of specific influenza, or even of ordinary rhinitis, than is generally recognised. The extension of pus from the main cavity of the nose to its accessory sinuses may be explained in two ways—one by *continuity*, the other by *projection*. These will be later considered in Chapter XXX.

The **naso-pharynx** is often the seat of various forms of catarrh, which are sometimes *primary*, and affect nasal, Eustachian, and adjoining regions by extension; or the inflammation may be *secondary* to disease in these latter regions, as when a suppurative catarrh of the middle ear or of the accessory sinuses discharges into the upper pharynx.

Many years ago, Luschka, in describing the pharyngeal tonsil, to be presently alluded to, drew attention to a depression or crypt situated usually towards the lower part of that structure, which

was somewhat larger and more defined than neighbouring crypts, and which ended as a dilated extremity or pouch. This pouch, though not a constant structure, is frequently present, and has since been known as 'Luschka's bursa.' It is, no doubt, a vestige of the communication which exists during a portion of fœtal life between the pharynx and the hypophysis cerebri.

Tornwald of Dantzig, who has made an extensive series of observations concerning catarrh of this pouch, regards it as a potent etiological factor in the production of post-nasal and Eustachian catarrh, pharyngitis, laryngitis, etc. In fact, he asserts that these bursal affections are to be found in so large a proportion as 20 per cent. of all diseases of the naso-pharynx. He also considers that this pharyngeal bursitis is often a sequel, not only of common catarrh, but also of scarlatina, variola, diphtheria, etc.

For my own part, I believe that the importance of this non-constant structure has been much exaggerated. For some time I have been endeavouring to confirm Tornwald's observations; but only very occasionally have I found any large catarrhal cavity into which I could insert a galvano-cautery point, this being the 'radical, active, and certain' treatment recommended by him.

The post-nasal space may be blocked by polypi, cysts, and hypertrophied turbinals projecting from the nasal cavities proper, or by fibroid and malignant tumours from the roof of the naso-pharyngeal area. But by far the most common affection is **hypertrophy of the pharyngeal or Luschka's tonsil**, to which Meyer of Copenhagen first directed attention, and which, called by him **adenoid growths** or **post-nasal vegetations**, are now generally recognised under those terms.

This overgrowth of the normal adenoid tissue of the pharyngeal vault is very frequently associated with enlargement of the faucial tonsil, with which it is analogous, and is usually met with between the periods of childhood or even infancy and adolescence. As a matter of experience, it has been found that, while enlarged faucial tonsils rarely exist in children without corresponding hypertrophy of the pharyngeal, the latter is found alone in about one-fifth of the cases that come under observation. The symptoms to which these adenoid growths give rise, and the appropriate treatment, will be considered at length in a later chapter.

Setting aside all theorising, the following summary concisely represents the various conditions, some symptomatic and some resultant, of the two great classes of nasal diseases, viz. hyper-

trophy and atrophy of the nasal structures, the first leading to obstruction, the second to undue patency of the channel, and both associated with disorders or abrogation of function.

In **obstruction of the nose and naso-pharynx,** any or all of the following subjective and objective characteristics may be experienced and observed:—

Subjective.

1. A feeling of *stuffiness*, and occasionally—as in polypus—the sensation of a foreign body, in the nose and head.
2. A sensation of *dryness* in the mouth and throat, especially on waking in the morning.
3. *Headache*, especially on mental application. In some cases there is frontal pain accompanied by throbbing.
4. *Aprosexia*, inability to concentrate attention, backwardness and stupidity; with giddiness, megrim, derangement of sleep, temper, spirits, and energy; melancholia.
5. *Sore throat.*
6. *Anosmia*, *Parosmia*, and impairment of *taste.*
7. Disorders of *common sensation* (hyperæsthesia or anæsthesia).
8. *Asthenia*, with either *lassitude*, *restlessness*, *depression*, or loss of energy and spirits; *Globus hystericus.*
9. A feeling either of *chilliness* or *feverishness.*
10. *Deafness* and *tinnitus.*

Objective.

11. *Mouth-breathing*, with the characteristic dropped jaw, and a *dry mouth* in the morning.
12. *A peculiar physiognomy*, due to pinched, collapsed, and dimpled alæ nasi, often associated with a wideness of the bridge of the nose, together with œdema and dilated veins about the root.
13. *Chest deformities*, accompanied by various degrees of imperfect lung expansion (*atelectasis*).
14. Noisy respiration in the day and snoring at night. In the case of children, sudden awakening from sleep as 'fighting for their breath.'
15. *Abnormalities of secretion*, occasionally complicated lachrymation and epistaxis, and sometimes ca

eczema narium. The secretions are only *exceptionally malodorous.*

16. *Vocal impairment.* This is either of the nature of want of resonance, deadness of speech, or inability to pronounce correctly the letters *m* and *n*, or to take the upper notes in singing. Associated with the foregoing may be included *vocal fatigue.*
17. Various morbid conditions of the *pharnyx*, *larnyx*, and *bronchi*, with sore throat, hoarseness, cough, and dyspnœa.
18. Many morbid conditions of the *ear*, including, according to some authorities, even deaf-mutism.
19. *Hernia*, *rectal* and *uterine prolapse*, from straining in efforts to free the nose from obstruction.
20. *Sneezing* and *reflex neuroses*, including vertigo, chorea, convulsions, stammering and stuttering, aphonia, asthma, epilepsy.
21. Red nose, facial erysipelas, œdema of the nose and conjunctiva, glaucoma and other eye lesions; goitre; lingual varix.

In **atrophic conditions** there are usually present:

22. Diminished secretion and crusts on the mucous membrane.
23. Ozæna.
24. Exaggerated nasal respiration.
25. Wide alæ, with narial orifices markedly open, and often nearly vertical, the tip of the nose being uptilted, and the bridge frequently depressed.
26. Atrophic or dry catarrh of the pharynx, middle ear, and even larynx.

CHAPTER XIII

DISEASES OF THE PHARYNX

[*Open out* PLATE II. *at end of the Book during perusal of this Chapter.*]

Hospital Statistics of Relative Frequency indicate that diseases of the fauces and pharynx constitute fully two-thirds of all cases of throat diseases, and one-third of the whole number treated in a hospital specially devoted to maladies of the throat, nose, and ear. The most common morbid affections of the throat which come under the category of pharyngeal disease are those which are inflammatory in their nature. In fact, inflammations of the pharynx and fauces constitute nearly a fourth of all throat diseases, and a third of faucial and pharyngeal affections.

Such maladies in these regions influence primarily the function of deglutition. If the isthmus of the fauces be narrowed, or if the antero-posterior space of the lower pharynx be diminished, as by abscess or new growth, pharyngeal respiration will be interfered with; and if the naso-pharynx be involved, nasal respiration will also be impeded, the senses of hearing, taste, and smell being consequently more or less impaired. Resonance and timbre of the voice are altered by pharyngeal disease, as also is speech (articulation), but the pitch of the voice is not necessarily affected.

Usually the pharynx is attacked as a whole; but, as Cohen has pointed out, there exist 'certain territorial regions, which, in consequence of participation in the same vascular, lymphatic, or nervous distribution, are apt to become sore or inflamed together. Thus the anterior surface of the palate and uvula, the anterior folds of the palate, the tonsils, and sometimes the base of the tongue, form one region; the posterior palatine folds, posterior surface of the palate, upper portion and vault of the pharynx, and posterior portion of the nasal fossæ, form another; the lower pharynx, epiglottis, lingual sinuses, and upper portion of the

larynx form a third.' It is principally to diseases in the first, and with a portion of the second, of these somewhat arbitrarily defined territories that our attention will be at present directed; that is to say, with

THE ORO-PHARYNX AND FAUCES.

These, as explained in the section on Anatomy, comprise that part of the throat which may be seen at the back of the buccal cavity by direct or reflected light, without the intervention of mirrors for exploration of the upper—*naso-pharyngeal*—or lower—*laryngo-pharyngeal*—region; or, to speak still more definitely, our first group will include—

Diseases of the anterior and posterior palatine folds.
" " posterior wall of the oro-pharynx.
" " base of the tongue.
" " soft palate and uvula.
" " tonsils.

The oro-pharynx and fauces are liable to inflammations which may be acute or chronic, forming the affection popularly known as 'sore throat.' Such inflammation may be general, and involve all the tissues; or, more commonly, as already mentioned, only portions of the various parts which combine to form the upper throat.

Inflammations of the pharynx, when primary, are usually called 'catarrhal'; though diathetic influences, to be scarcely considered secondary, as those of rheumatism and scrofula, as well as functional abuses, frequently play an important part in the origin and course of the disease broadly—that is to say—loosely denominated catarrhal pharyngitis.

The grades of pharyngitis may vary from a simple hyperæmia or erythema, with slight submucous infiltration, to an acute phlegmonous inflammation with considerable serous, fibrinous, or purulent exudation, such modifications depending largely on the nature of the etiological factor. The milder forms are generally due to cold or chill, and for the most part exhibit merely local symptoms of no particular gravity; the second have a diathetic or septic origin, and, exerting a wider and more serious influence on the general economy, call more urgently for constitutional as well as local treatment. To these may be added inflammation due to irritant poisons or to direct injury.

I agree with Schech in not recognising a purely **gouty** sore

throat, although I have seen cases in which the administration of gouty specifics was a necessary adjunct to the local measures taken for relief. Nor do I consider it necessary to speak of a **rheumatic** angina as a separate malady, thoroughly convinced though I am of the very frequent influence of such a diathesis. I have, for example, often seen cases of pharyngitis, subacute in intensity, and characterised by undue hyperæmia, and great irritability of the mucous membrane, associated with eczema, especially of the auricle, and concerning the gouto-rheumatic nature of which there is, of course, but little difference of opinion. To further simplify the subject, I do not devote any space to **herpes** of the pharynx, because it is a decidedly rare disease in this country. In the very few cases I have seen, the herpetic eruption has been manifested on the anterior portion of the soft palate. Occasionally, also, I have witnessed an **aphthous** exudation in the pharynx of the adult, unaccompanied by general stomatitis. The patients have, for the most part, been females. Schech mentions also a pharyngitis following scurvy, and gives to it the name of angina **scorbutica.** Neither of these appears to me to require separate consideration.

Varieties of pharyngeal inflammation, more legitimately considered secondary, are those arising in the course of the continued fevers and exanthemata; those due to the toxic influence of impure water and defects of drainage; and the special manifestations which are exhibited in this region in connection with syphilis, cancer, tuberculosis, and lupus.

It is important to note that all varieties of pharyngitis are associated with more or less nasal obstruction.

Acute Pharyngitis, Cynanche Pharyngea, Angina Simplex vel Catarrhalis (Plate II., Figs. 12 and 13).

Etiology.—**Hospital Statistics of Relative Frequency** show that the proportion of acute pharyngitis to all throat diseases is less than 2½ per cent., and to diseases of the fauces and pharynx alone about 5 per cent. Indeed, an acute inflammation of this region, without definite evidence of sepsis, is uncommon; and, when uncomplicated with some general fever, the acute attack, for the most part, presents itself as an exacerbation of a subacute condition, or as an extension of an acute naso-pharyngeal catarrh.

Age exerts, in my experience, but a very indefinite influence on catarrhal pharyngitis, though common sore throat is said

to be most frequent in children and youths. When such is the case, a scrofulous diathesis is generally at the root of the trouble; while in the adult the constitutional tendency is most frequently rheumatic, this being evidenced in varying degrees in different individuals. In all, poor food, insufficient clothing, bad ventilation, and any circumstance likely to vitiate the general circulation, are amongst prominent predisponents. In the adult, occupations of a sedentary character, as well as those involving respiration in poisonous atmospheres; alcoholic intemperance; the abuse and even use of tobacco; over-indulgence in highly-seasoned dishes; and the taking of over-hot fluids, are factors to be sought for, and when present corrected, since they all act as local, and many of them as general, predisponents.

Amongst the most usual exciting causes is that of a 'cold.' Occupation of a sedentary character, in which the subject takes insufficient exercise for the well-being of his general circulation, has been mentioned as a predisponent; but it is probable that in such a case the patient has carried on his employment in an insufficiently ventilated room, for I find pharyngitis equally common amongst tailors who sit, and in printers who for the most part stand, to their work, the atmospheric conditions being equally pernicious in both cases. In these and many other trades, the exciting cause is generally a 'chill,' mainly brought about by exposure to draughts of cold air striking on an overheated body. The disease is thus also common in people engaged near hot furnaces, and in those who, working in ill-ventilated and over-crowded rooms, are exposed to draughts, or who go out of such rooms and encounter a sudden change of atmosphere. Damp-cold air is particularly likely to cause inflammation of the throat; hence the majority of such cases occur in the spring and autumn, or during a thaw after hard frosty weather. Use of the voice under unfavourable conditions may lead to acute pharyngitis, whether followed or not by inflammation of the larynx. Amongst traumatic causes of pharyngitis may be named irritant poisons, boiling water, the scorching heat of steam or flame, and the lodgment of foreign bodies, as the small bones of fish, game, etc.

Children are very liable to simple catarrhal sore throat, sometimes as the result of a specific fever, of which measles is the most frequent; the local tendency may pass off as the child grows up, though too frequently the predisposition is perpetuated in a liability to more serious catarrhal disorders, which perniciously influence the whole period of life.

As previously pointed out, the majority of cases of pharyngitis

are met with in the victims of nasal and naso-pharyngeal obstruction, and this is especially noticeable in the case of the young.

SYMPTOMS: A. FUNCTIONAL.—The **voice** is thick and husky, but there is rarely actual hoarseness or aphonia unless the disease extend to the larynx. Use of the voice quickly induces fatigue, and is not infrequently painful.

Respiration.—Unless associated with laryngitis there is no dyspnœa, but nasal respiration is often obstructed.

Cough.—True cough is seldom present, but there is usually a constant tendency to hawk or *hem*, accompanied by scanty expectoration of viscid, transparent, more or less greyish pellets of mucus, which are occasionally streaked with blood.

Deglutition.—The act of swallowing is always painful, or in the acute form of the disease is attended with more or less discomfort.

Hearing is usually impaired in those cases where there is enlargement of the faucial, pharyngeal, or tubal tonsils, or even in inflammation of the posterior pillars of the fauces.

The **Senses** of **Taste** and of **Smell** may be both temporarily impaired.

Pain, independently of exercise of function, is a marked symptom of pharyngeal inflammation, but may vary widely in intensity. There is very generally first described, a feeling of stiffness, with itching; then stinging or shooting, followed by a sensation as of great tightness and constriction, and of the constant presence of a foreign body in the throat, causing the patient to repeatedly perform the act of swallowing. Pain in the tympanum is either the result of Eustachian catarrh and obstruction, or it is conveyed from the throat along the main trunk of the glosso-pharyngeal to Jacobson's nerve. When pharyngitis extends to the laryngo-pharynx, every movement of the larynx, or even of the neck, may be attended with distress.

B. PHYSICAL.—**Colour** is increased according to the severity of the attack, from a simple bright pink to a livid scarlet, and with exaggeration of the calibre and visual prominence of the superficial capillaries. The coloration varies also greatly in different portions of the inflamed region. The posterior wall of the pharynx is, as a rule, the most heightened in colour, though sometimes only the soft palate will be hyperæmic; while in other cases the surface of the tonsils may be the sole portion of abnormal hue. The uvula and fauces may be translucent from œdema, and the hyperæmia in this region is always greater than in the lower

portion of the pharynx. As a rule, the whole of the visible pharynx and fauces is involved, but occasionally, as in PLATE II., Fig. 13, only one side is attacked.

CASE VII.—The patient from whom this illustration is taken is a comic opera soprano of eminence, and affords a striking example of that strong predisposition that public singers—especially those of the female sex—evince to acute pharyngitis and tonsillitis of insanitary origin, to which, in the generally unsound condition of theatres and opera-houses, they are so much exposed. This lady is particularly liable to these attacks, which are characterised by considerable pain and discomfort in swallowing and speaking, and also in singing; but as a rule the vocal cords are not affected, and she continues her duties throughout the attack. It will be observed that the faucial pillars are the parts mainly involved, and that the tonsil, although not enlarged, is the subject of acute lacunar inflammation; also that the disease is confined to one side and extends to the lingual tonsil. **Bacteriological** examination gave evidence of moderately short and only slightly flexuous streptococci and of staphylococci. A few weeks after this drawing was made, this patient was attacked by typhoid fever.

Form, etc., is modified according to the amount of submucous or serous infiltration. The surface texture is at first shiny and smooth; later it becomes thickened and velvety; or roughened and granulated, owing to the prominence of hypertrophied lymphoid glandules. Loss of tissue is rare, unless the attack be due to toxic irritants or to traumatic causes.

Secretion is at first arrested, causing the throat to feel dry and rough, or producing a sensation as if a hair were in the throat; later, it becomes viscid and tenacious; and, lastly, mucopurulent or purulent. I am in agreement with Beverley Robinson in not recognising a fibrinous exudation as a usual or even occasional concomitant of a pharyngitis or tonsillitis, unless the inflammation be septic or traumatic in origin, on this point differing from Bosworth. I am even inclined to suspect the simple catarrhal origin of the attack when œdema extends beyond moderate infiltration of the extremity of the uvula present in almost every case.

Both Cohen and Bosworth describe a 'common membranous sore throat,' both authors agreeing to give an almost verbally exact portraiture; but it is not familiar to me, and must be rare in this country. It is said to be an acute inflammation of the mucous lining of the pharynx, characterised by the eventual exudation of a fibrinous material which coagulates on the surface into a pellicle or pseudo-membrane, and is oftentimes mistaken for diphtheria, from which, in our present knowledge, diagnosis could only be established by a bacteriological examination,—a procedure to be always adopted. The accompanying drawing (Fig. CXLVI.) represents the nearest approach to such a condition that I have myself encountered.

CASE VIII.—It was taken from the throat of a gentleman aged forty, who had suffered from acute rheumatism at seventeen, and had recently returned from Australia, after a residence there of over twenty years. During that time he had occasionally suffered from pleurodynia and flying muscular pains, but from no serious rheumatic attack, nor from sore throat. The illness for which he applied to me occurred on the first approach of damp and cold weather, in the autumn following his return home. He complained of excruciating pain in swallowing and talking. On examination, the whole of the soft palate was seen to be intensely inflamed, swollen, and relaxed, with enlargement and blocking of the glandules, and presenting very small, easily dislodged pellicles of fibrinous exudation with some inflammatory areola (Fig. CXLVI.). There was no evidence of a septic origin, but complaint was made of a general aching of the body 'like rheumatism.' The tonsils were not affected. I prescribed aperients, salicylate of sodium, local application of cocaine, and the sucking of ice in small pieces. The attack subsided in a very few days.

FIG. CXLVI. — ACUTE PHARYNGITIS, WITH SLIGHT EXUDATION (HERPETIC).

In many respects this case resembles the accepted description of herpes of the pharynx, but there was no manifestation on the lips or elsewhere, nor had the patient ever suffered from herpes. The exudation was moreover bilateral.

C. MISCELLANEOUS.—**External and General.**—The usual constitutional, premonitory, and concurrent symptoms of inflammatory catarrh are always present, though they are greatly modified according to the severity of the local disease. The temperature at the onset is often increased out of proportion to the gravity of the attack—this especially in the case of young children; the digestive system is almost invariably at fault, the bowels being constipated, the tongue furred, and the breath foul; while the urine is highly coloured and loaded with lithates. There is frequently co-existing pain in the muscles of the neck, the loins, and the joints of the body generally, and headache is an almost constant symptom.

Commemorative.—The disposition to pharyngeal catarrh is often inherited; and, as already stated, is not unfrequently associated with a special diathesis.

PROGNOSIS is favourable, although suppuration of the deeper tissues (pharyngeal abscess) and extension of the inflammation to the larynx are possible eventualities. It is a tradition that when sore throat passes into a 'head cold,' the circumstance is of favourable omen. Convalescence is frequently delayed by the disease becoming chronic.

TREATMENT: **Constitutional.**—Free purgation, especially by saline preceded by some form of mercury, is in my opinion an indispensable first step; tincture of aconite in one-drop doses (Form. 87), until the pulse is lowered and perspiration induced, or the salicylates with chlorate of potassium or sodium (Form. 92), act well when the inflammation is associated with rheumatism. All other constitutional states predisposing to or accompanying the local inflammation require to be dealt with on the lines of general therapeutics. Fränkel advises quinine in the early stages, believing that it often cuts short an attack. During convalescence, alkalies, with vegetable tonics, are generally indicated. To these arsenic and nux vomica may often be usefully added.

Local.—Lozenges of guaiacum, menthol, and of menthol and eucalyptus (Form. 17, 18, 19) relieve capillary engorgement; the first-named may probably also act constitutionally where the diathesis is arthritic. Ice taken in small pieces is always grateful; but in some cases mouth-washes or gargles of warm water more or less medicated are preferred. In pharyngeal disease, steam inhalations are almost always fatiguing, and seldom afford proportionate relief. Applications of lunar caustic, though still much in vogue, have not afforded, in my experience, sufficient mitigation of suffering to compensate for the discomfort they occasion; and the same may be said of astringents, except in the initial stage. Glycerine of tannin, so commonly applied, acts usually as an irritant, on account of the attraction of the glycerine for the fluid elements of the mucous membrane, to say nothing of the suspicion that tannin does not contract, but dilates the blood-vessels. The sucking of ice or the use of a hand-ball spray of cold water are measures perfectly innocuous, and in many cases act both gratefully and beneficially. Where there is much pain with hyperæmia, cocaine in a 5 per cent. solution may be used with at least temporary relief, and should be applied by means of the spray; but superior to all remedies, as an analgesic, antiseptic, and resolvent, is guaiacol employed as a paint, or directed as a spray (Form. 60), to both throat and nose. The menthol spray (Form. 64) is of similar service but in a minor degree, and therefore to be employed in the less severe cases, or as the acuteness of the inflammation subsides. When a bacterial origin is demonstrated, appropriate germicides are indicated, and disinfecting washes by means of the throat syringe. *Externally*, wet compresses, and in some cases the continuous cold coil, are of utility. Strong counter-irritants are decidedly harmful, nor, in my practice, are leeches ever employed.

Operative.—If œdema be excessive, scarification may be called for, or ablation of the uvula may be necessary, on account of the actual discomfort it occasions, or of the irritation of the larynx that it induces. Removal of the relaxed tissue and cauterisation or curetting of excess of lymphoid tissue is better deferred until subsidence of the acute stage, because of the possible tendency to sloughing, and because during an inflammatory attack it is not easy to judge how much should be removed. The nature of nasal stenosis must be carefully ascertained, and the condition be later submitted to appropriate treatment.

Dietetic.—Unless the patient shows signs of exhaustion, food should not be given at more frequent intervals than usual, although refreshing beverages and simple succulent fruits may be allowed in moderation. In order to give rest to the function of deglutition, all food should be bland, semi-solid, and warm. Stimulants are by no means necessary, the favourite port-wine treatment of tradition being a fallacy.

Hygienic.—Predisposing causes, having been carefully ascertained, must naturally be guarded against, and in children especially the most probable predisponents should be promptly and thoroughly obviated. Spring and autumn being the seasons most favourable to this form of angina, patients should particularly guard against a too sudden change of their clothing, and an abrupt variation of habits of life indicated by the alternation of season. Above all things the subjects of catarrhal sore throat should avoid constipation. When attacks are frequently recurrent, a course of treatment at Aix-les-Bains has a powerful effect in diminishing the patient's liability. Cold baths, and especially external local douching with cold salt and water, appear to act as prophylactics against 'catching sore throat'; but in subjects who suffer from defective circulation, such Spartan treatment is by no means to be recommended, and warm baths followed by cold douching, or the standing with the feet in hot water during the drying of the body after a cold bath, will often be preferably employed. In this connection it may be usefully hinted that in many cases the sea or river bath, as taken in this country, is not only contra-indicated, but is positively injurious.

Phlegmonous Pharyngitis, Suppurating Pharyngitis, Hospital Sore Throat.

These terms have been applied to that form of acute pharyngitis which occurs in patients whose systems have become much

reduced by hard work under insanitary conditions of the atmosphere, and in some cases also of the water supply. Thus, amongst the causes of the disease may be mentioned work in the dissecting-room, absorption of septic material from unhealthy wounds, the nursing of patients suffering from erysipelas and various fevers, exposure to bad drainage, drinking unwholesome water, etc.

Clinically, the pharyngitis sometimes occurring in patients suffering from *small-pox*, *typhus*, and *typhoid fevers*, is analogous to this form of sore throat. In all of these the preponderating organism is a streptococcus; this is also true of the throat inflammation of scarlet fever, which occupies, however, a different position, since pharyngitis is an early and almost constant element of the disease. A septic form of pharyngeal inflammation—at least of high degree—is not often associated with either *syphilis* or *tuberculosis*.

A variety of pharyngitis which may be considered as belonging to the category of phlegmonous inflammations, but not often seen in our country, is that described by Stöerk as *chronic blennorrhœa*. It is endemic in Poland, Galicia, and Wallachia. It first makes its appearance in the nose and naso-pharynx in a form similar to the ozæna of hereditary syphilis, and slowly extends downwards through the pharynx, larynx, and in exceptional cases even to the trachea and its bifurcations. The inflammation is of the phlegmonous type; the secretions are muco-purulent in character, and are probably the vehicle for the spread of the disease, which in its general aspect bears a resemblance to an early throat manifestation of syphilis.

SYMPTOMS.—The particular diagnostic sign of phlegmonous pharyngitis is that it is by no means confined to the submucous areolar tissue, but generally extends to the deeper structures, leading to suppuration, which may burrow either beneath the deep cervical fascia, or may point and open into the œsophagus. Or, as is not unfrequently the case, œdema of the larynx may occur, with imminent danger of suffocation. The inflammation is very apt to take on a sloughing character, which may result in severe and even fatal hæmorrhage.

The tonsils in phlegmonous pharyngitis are always, from the first, highly inflamed and greatly swollen, so much so, that the disease may at first be mistaken for a tonsillitis. Differing from what occurs in the other tissues of the pharynx, the tonsillar inflammation is principally of the mucous membrane and peritonsillar connective tissue, and does not, as a rule, extend to the

parenchyma or gland structure itself. The tonsillar swelling is usually bilateral,—a diagnostic point of some distinction from ordinary quinsy,—and may be so extreme as to seriously threaten life by direct obstruction of respiration, both naso-pharyngeal and oral. The act of swallowing is equally distressful, and may become impossible. Ulceration may take place from the attrition and consequent irritation of the highly-inflamed surfaces, leading to gangrene of varying area and depth. All the other symptoms of acute tonsillitis, to be later described, are present in an exaggerated degree. The glands of the neck are often most painfully swollen, rendering every movement of the head most agonising.

The attack is usually ushered in by a feeling of illness, with languor, headache, etc. Then follow quickly a rigor, high temperature, rapid pulse, and the other phenomena of fever, with delirium at a very early period. The throat, at first dry, soon becomes clogged with thick foul mucus, and acute pain in deglutition is one of the first local symptoms. The general course of the disease, when its origin is unassociated with some specific poison, is very similar to that of erysipelas. Some authors have described an erysipelas of the throat, in which a condition of the pharynx and fauces as just described is found associated with erysipelas of the head, face, or neck. It is unnecessary to point out that the etiology, pathology, course, and treatment of such a sore throat does not materially differ from that under present consideration. Bacteriological examination also gives an almost invariable evidence of a streptococcal infection (Figs. CXLIV., CXLV., p. 216).

PROGNOSIS.—The forecast of phlegmonous pharyngitis is always most unfavourable, there being a very great tendency to sloughing, to extension of the disease into the larynx, and to general septicæmia. There are also the dangers of suffocation already alluded to, as well as the risk of abscesses bursting into the œsophagus, the passage of pus into the trachea during sleep, or of hæmorrhage from extension of ulceration into some of the larger vessels of the neck. The duration of the attack is from three days to a fortnight. Convalescence, which is always tedious, is accompanied by many complications when suppuration has been extensive. Temporary paralysis of the muscles of the palate, fauces, and pharynx is a not unusual sequel. The prognosis of an external erysipelas that extends to the mucous membrane of the throat is always most grave.

TREATMENT.—The constitutional symptoms being of much

greater severity and importance than in simple pharyngitis, **general** treatment must receive special and prompt attention, local measures being, however, by no means neglected. Great importance is to be attached to tonics, especially iron, chlorate of potassium, and bark; whilst stimulants in large quantities are often indicated.

One or two cases have been reported of successful treatment with anti-streptococcus serum; but there is hardly yet sufficient evidence in favour of the remedy for this class of case to justify its recommendation. 'If 'twere done, 'twere well it were done quickly,' for the march of the disease to a fatal issue is very rapid.

Of **local** remedies, one of the first in importance is the application of cold externally by the Leiter coil, cloths wet with ice, cold water, and the like, and the sucking of ice or the taking of iced drinks. The surgeon is often tempted to make incisions and scarifications to relieve pressure, but such wounds almost invariably slough, and should not be made unless there is distinct evidence of pus. It is right to add, however, that Stoerk, Fränkel, and Schech advise free incisions, even where there is no pus to be liberated, believing that this measure gives relief to tension, and that the blood-letting diminishes the inflammation. Scarification of the larynx is an operation often recommended in books, but is not easy of performance when the fauces are swollen to the extent usual in this disease.

Tracheotomy is not unfrequently called for, on account of dyspnœa from extension of œdema into the larynx, but, unfortunately, in too many instances the patient fails to rally after its performance. In cases of erysipelas the disease will be almost certain to extend to the tracheal incision.

Where obstruction to respiration is due to enlargement of the tonsils, it is better to excise these glands before proceeding to the major operation of opening the windpipe.

Mouth-breathing being a strong predisponent to the disease in the adolescent, it will be well in cases of recovery to make a full examination of the nasal fossæ and naso-pharynx, and, as a precaution against recurrence, as well as on general principles, to treat surgically any obstructive condition to a free breath-way that may exist.

Ulcerative septic pharyngitis.—Independently of the acute variety of hospital sore throat just described, one occasionally sees a milder form of acute pharyngeal inflammation in the persons of those closely engaged in post-mortem and dissecting rooms, and

also in surgical wards—but happily not so frequently in these days of Listerism as was formerly the case. The symptoms are those of faucitis, without marked œdema, but with small shallow ulcerations of a lenticular shape, and covered with a grey pellicle, equally distinct from the yellow caseous excretions of lacunar tonsillitis, the opalescent mucous patch of secondary syphilis, the excavating ulcer of tertiary disease, and the tough membranous deposit of diphtheria. Constitutional disturbance may be out of all proportion to the local lesion, which is often slight.

TREATMENT consists primarily in removal of the patient from the area of contamination to the country or seaside. While the majority of these cases will then speedily recover under local antiseptics and general tonic treatment, continuance of duty in a vitiated atmosphere will not only render all treatment futile, but may lead to the development of the graver form of malady.

Cauterisations so usually adopted are of doubtful utility.

POST- OR RETRO-PHARYNGEAL ABSCESS.

ETIOLOGY AND PATHOLOGY.—General diffuse suppuration of the pharynx is fortunately a very unusual termination of acute inflammatory attacks in this region, whilst circumscribed abscess in the post-pharyngeal region still more rarely comes under the care of the throat specialist. Bokai, to whom we are much indebted for the correction of many errors concerning the disease, reported only 204 cases as occurring in the Children's Hospital at Pesth, during a period of twenty-six years. Since the publication of Bokai's monograph, it has been generally assumed that the disease is mainly one of childhood; but, for myself, I may say that with an experience of thirty years of out-patient work in institutions treating on an average 5000 cases a year of disease of the region involved, I have seen twice as many cases in adults as in children.

Formerly, retro-pharyngeal abscess was supposed to be almost always associated with caries of one or more cervical vertebræ; but it is now conceded that comparatively few cases are due to this cause, and the condition is generally recognised as the consequence of a phlegmonous inflammation of the loose connective tissue between the pharynx and the vertebral column; and in a still larger number of cases as a suppurative lymphadenitis, the origin of which is in the deep lymphatic glands which are situated on each side of the second and third vertebræ, and are particularly large in the earlier years of life. There are thus two distinct classes

of retro-pharyngeal abscess to be recognised, those connected with the soft parts, and those occurring as a result of caries of the spinal column. I agree with Lefferts, that nasal disease is but a rare cause of the affection under notice, and the same may be said of suppurative affections of the ear, sometimes quoted as etiological factors of post-pharyngeal abscess. Only a very few cases occur as sequelæ of other diseases, those reported being generally observed in connection with scarlet fever, diphtheria, and the like. Other causes are metastasis, of which Nélaton has reported examples in connection with perinæal suppuration; and traumatism, as from a foreign body. I remember a case in which the first cause was lodgment of a fish-bone. This was followed by abscess and post-pharyngeal sinus, necrosis of vertebræ, and later by pyæmia.

The dyscrasiæ predisposing to the disease are scrofula and syphilis. I have seen two cases in adults, in whom it was not possible to obtain a venereal history, and in these the malady appeared to be due to exposure to wet and cold, with indifferent general surroundings of food and dwelling-place.

SYMPTOMS: A. **Functional.**—The local signs are not often manifested until the disease has made considerable advance. The chief symptom is that of **dysphagia,** the swelling causing a mechanical obstruction to the passage of food; this is not, however, an invariable sign. Coupled with it there may possibly be **dyspnœa,** especially if the abscess involves the laryngeal region, or induces œdema of the glottis. The respiration is almost always stertorous, and when the larynx is involved it is stridulous. **Cough** of the nature recognised, as due to the effort to clear the throat of a foreign body, is a common evidence, and especially when the post-pharyngeal obstruction presses against the larynx, or when there is secondary œdematous laryngitis. The **voice** is thick and void of nasal resonance. All functional efforts are followed by extreme general exhaustion. A characteristic symptom of vertebral disease is the **pain** occasioned by movement of the head on the spinal column, causing the patient to keep the head quite stiff when the abscess is in the middle line, or to incline it away from the affected side when the suppuration is situated in one or other lateral space. In children convulsions are not unfrequently witnessed. The **temperature** may be hectic or negative.

B. **Physical.**—With the reflected light of the frontal mirror a large swelling may often be observed, the diagnosis, especially in the case of adults, being assisted by the use of the laryngeal mirror; palpation with the index-finger will show the tumour to be of 'doughy,' semi-elastic consistence, indicating the presence of

pus. Examination by this method should never be neglected. It presents no difficulty, if the mouth be propped open, and the finger-guard employed; nor does it require pre-administration of chloroform, as has been advised by some authors. A spray of cocaine might, however, be employed to allay the fears and indeed the pain of sensitive subjects.

PROGNOSIS is very grave where there is spinal caries, but records are not wanting of a favourable termination. In children there is also the additional risk of suffocation from bursting of the abscess during sleep. The most favourable prospect is afforded in those cases in which, early diagnosis being made, prompt precautions are taken against any such danger.

TREATMENT.—Some surgeons recommend great caution in the evacuation of the pus; but I have seen no untoward result from a free opening with the laryngeal lancet. The only precautions necessary are, first, to keep the incision as nearly as possible in the mesial line, so as to avoid wounding the internal carotid, and then to incline the patient's head forward so as to prevent passage of pus into the larynx; or the patient may be operated on with the head downwards, over the end of a table. The cavity should be well scraped, and washed out with a syringe, and, when large, may require to be packed with iodoform or perchloride gauze. In pre-laryngoscopic days, and even still, by surgeons not employing the mirror, pus has evacuated by an external incision in the neck. Of course the abscess occasionally points in this situation, but in these circumstances the case belongs to another category. Artificial feeding by an œsophageal tube may be required for a lengthened period, especially in those cases in which there is fistulous communication with the larynx. Iodide of iron, with cod-liver oil, etc., is almost always serviceable as an aid to convalescence, and other suitable constitutional remedies are to be administered wherever the dyscrasiæ give the practitioner indications of their requirements.

SUBACUTE PHARYNGITIS (Fig. 14, PLATE II.).

All the functional symptoms of the acute disease, modified in intensity, are present in this form. It is often seen in association with the milder exanthemata, as chicken-pox (Fig. 61, PLATE VII.), measles, and rötheln. When associated with eczema, herpes, or aphthæ, to which allusion was made in the prefatory remarks of this chapter, the type is generally of the subacute grade.

SYMPTOMS: A. **Subjective.—Voice** is easily fatigued and

somewhat hoarse, due to laryngeal irritation, and it may be to rheumatic inflammation of the muscles.

Cough is tickling and irritable, but seldom or never painful.

Deglutition is, without being exactly painful, performed with undue consciousness, and there is a frequent desire to swallow the saliva, or to exercise the muscles of the fauces and pharynx.

Pain is neither constant nor acute; it varies greatly with the temperament of the individual.

B. **Physical.—Colour** is increased, but by no means uniformly over the whole surface: for instance, the pillars of the fauces and the uvula may be hyperæmic, while the rest of the surface is normal; or one side of the throat only may be red, while the other is unaffected.

There may be some **swelling** and **thickening** of the mucous membrane, and there is generally some disorder of **secretion**, this being increased in quantity, and changed in quality from a clear viscid to a thick yellowish, or even greenish fluid. When associated with any of the exanthemata above mentioned, the respective cutaneous manifestations will be reproduced with slight modifications of the mucous membrane. Constitutional symptoms are of but slight importance.

TREATMENT being commenced, as is always necessary, with purgatives, may then be almost confined to local measures. Guaiacum lozenges (Form. 17) are most suitable if there is any soreness, or if the pillars of the fauces are inflamed: astringent lozenges (Form. 12, 14, 15, and 19) and gargles (Form. 5) are indicated if the pendulous soft palate be the region affected.

With reference to **prophylaxis**, no person liable to these attacks, seeing the part digestion plays in them, should take sparkling wines, beer, or any fluid containing partially fermented substances. I am also in the habit of forbidding pastry, preserves, and such vegetables as turnips, carrots, parsnips, and radishes.

The hygienic directions recommended to persons liable to the acute form of sore throat are also to be observed by those subject to the milder attacks.

CHRONIC PHARYNGITIS—CLERGYMAN'S OR VOICE-USER'S SORE THROAT (Figs. 16 and 17, PLATE II.).

This form of pharyngitis must not, as is sometimes the case, be confounded with chronic 'follicular' tonsillitis, from which, indeed, it is quite distinct. It may occur simply as a sequel of the acute or subacute form, or it may be caused by one or other

of the influences about to be mentioned. It may be present simply as a more or less general congestion, with thickening of the pillars of the fauces, and without features, except its chronicity, to distinguish it from the subacute form (Fig. 14, PLATE II.); or the throat may present the appearances which have led to the use of the various terms—granular, glandular, follicular, or herpetic pharyngitis (Figs. 16 and 17). Looking on the pathology of the disease as one of venous congestion, leading to perversion of secretion, with more or less enlargement of the follicles of the pharyngeal mucous membrane, I do not recognise these distinctions, and propose to consider all these disorders under one heading. Equally misleading are such subdivisions as hypertrophic and exudative. Morell-Mackenzie, in detailing the objective symptoms of 'Clergyman's Sore Throat,' gives a description of an 'exudative form of follicular pharyngitis,' which is, in point of fact, a word picture of so-called follicular tonsillitis, and with this it is indeed confused. But it need hardly be pointed out that in etiology, pathology, and other indications for treatment, the two diseases are quite distinct; and their consideration as one, is surprising in an author who seldom erred on the side of generalisation.

ETIOLOGY.—Chronic pharyngitis may in a measure be due to disorders of either the glandular, the nervous, or the digestive system; its causation may be connected indiscriminately with phthisis, with venereal excesses, or with chronic alcoholism; overuse of tobacco is also assigned as a cause, and in such cases it will often be found that the individual has been in the habit of constantly expectorating during smoking, and has thus perverted the normal secretion. In other cases, the pharyngitis may be due to the effect of nicotine on the vasomotor system; or, again, it may be induced by direct irritation of particles of tobacco, as in snuff-takers. With respect to the connection between pharyngitis and certain diatheses and diseases in other parts of the body, neither acne nor herpes, according to my experience, plays an important part as a cause, as has been stated by Isambert and other French authors. I have found many patients the subject of chronic pharyngitis who were not subject to any form of acne or herpes; but seeing that such affections, as well as granular pharyngitis, are due, in some measure, to disorder of the processes of excretion, or to vasomotor weakness, it is not surprising that they should sometimes co-exist.

Among the most prolific causes of chronic pharyngitis must be reckoned improper use of the voice. By this expression must

be understood not simply improper voice-production, improper use or over-exertion of voice, which may mean forcing—an act entirely controlled by the pharynx—but also use of the voice, whether rightly or wrongly produced, at improper periods; for instance, public speaking, during catarrhal attacks, as in clergymen and actors, with whom the exercise of the function is a professional necessity; in inclement weather, or under unfavourable circumstances of surrounding noise, causing the individual to speak in too loud a voice, as with military men on the field of battle, open-air preachers and politicians, auctioneers in the dust of sale-rooms, and hawkers and costermongers exposed to the influence of noisy streets and vehicles. Certain it is that this affection occurs more frequently in professionally voice-using subjects who have not, as a rule, had proper voice-training. The particular faults in voice-production, giving rise to chronic pharyngitis, have been dwelt on at great length in *Voice, Song, and Speech*, to which book the reader may be referred. They have been well described by Carl Seiler as due to repeated transgression of the natural limits of the normal registers of the voice, and the *modus operandi* of the pathological process has been accurately explained by him.

Another main cause of the disorder is mouth-breathing, due to nasal stenosis, whatever the origin thereof.

The increased liability for bicyclists to breathe with open mouth, in consequence of the rapidity of their motion through the air, has led to a notable increase of chronic pharyngitis and also laryngitis, and to them the term 'bicylist's throat' has been applied.

Finally, it is almost universally admitted that chronic pharyngitis is very frequently the sequel of oft-recurring acute attacks.

Hospital statistics of relative frequency demonstrate that chronic pharyngitis constitutes 11 per cent. of all throat diseases, and 24 per cent. of those in the fauces and pharynx. The comparative frequency of chronic pharyngitis to the acute is in the ratio of 4 to 1.

PATHOLOGY.—Chronic pharyngitis differs from the acute form, not only as regards its duration and course, but also inasmuch as the hyperæmia is less intense and less diffuse, and is not accompanied by so much general swelling. On the other hand, enlargement of the glandules in isolated groups, or in large patches, is oftener observed during chronic than during acute inflammation in this region; and engorgement of the superficial veins of the pharynx—a condition never present in acute catarrh—is quite common in the chronic form. The morbid process by

which a throat arrives at a chronically inflamed condition has been considered in treating of its causation. In vocal cases it appears to be purely of the nature of a glandular hypertrophy, the result of an overloading of the vessels by misdirected force; in others it is due to causes which diminish vasomotor control. Concurrently with this overgrowth, the secreted material becomes changed in character, being first excessive in quantity, then deficient in fluid elements, and finally diminished in both quantity and moisture. This last condition represents the dry stage—*Pharyngitis sicca*—which has also received as synonymous the term *atrophica*, because at this period of the disease there is a distinct wasting of the mucous membrane and of the glandular structures of the diseased region, the atrophy being limited to the posterior wall of the pharynx, and to the naso-pharyngeal cavity. There is little doubt but that in many cases this atrophy is an advanced stage of the hypertrophic inflammation. It may, however, also occur as a primary affection, though in such a case the etiology is expressive rather of a constitutional than of a functional defect. The process does not attack all parts equally, and wasted tracts will often be observed side by side with hypertrophied granulations (Figs. 15 and 16, PLATE II.).

There is a variety of pharyngitis which has not been described by writers of this country, but has for some years been denominated by Continental specialists as *Pharyngitis lateralis hypertrophica*. This term is not to be regarded as simply representing a condition opposed to that of atrophic pharyngitis, since it is limited by its sponsors to inflammatory thickening of the lateral bands or posterior pillars. Since my attention was drawn to it, I have been on the look-out for such a lesion as a separate variety of pharyngeal inflammation, and my impression is that its claim to this distinction has been somewhat exaggerated. Nevertheless it is certainly true that in obstinate cases of chronic pharyngitis, especially those due to vocal causes, one may sometimes see a persistent redness with swelling, either continuous or beadlike, of the tissues immediately behind the posterior pillars, in the situation of the salpingo-pharyngeal fold. I have also observed this condition, particularly in those cases in which the inflammatory process has extended along the Eustachian tube, and has led to defect of hearing. But I hardly think that such a lesion is ever seen as an early or separate manifestation of a chronic pharyngitis. In my judgment it simply represents a variety of degree, or an advanced stage of the general pharyngeal inflammation. Nor, to anticipate somewhat, have I found it

necessary to advise—as is done by our Continental *confrères*—the cutting away bodily by the knife, or *wholesale* destruction by the cautery, of these more or less pronounced hypertrophies of normal structures.

CASE IX.—The accompanying drawing (Fig. CXLVII.) illustrates this condition. It will be seen that, with the exception of a few granulations in the centre of the posterior wall, the inflammation is confined to the parts above indicated. The subject was a clergyman, æt. 40, who had been under my care four years previously for chronic relaxation of his uvula, and varix at the base of the tongue. The uvula had been reduced and the varicose veins destroyed by galvano-cautery, and the cure had been confirmed by a course at Aix-les-Bains. From that time the patient had not suffered, but for the last eighteen months he had been without a curate, in addition to the fact that his church was a large one. He confessed that he had used his voice on several occasions with great effort. The immediate cause of his breakdown was the performance of four services without any aid in one day, eight days previous to his visit. On his coming to me his voice was almost entirely gone, and, in consequence of peripheral irritation of the superior laryngeal nerve, there was almost constant spasmodic cough, which had prevented him from sleeping for three nights. He also experienced pain and a sensation of rawness; this last being produced, as he thought, by the incessant cough.

FIG. CXLVII.—CHRONIC PHARYNGITIS LATERALIS HYPERTROPHICA.

An illustration of this form of hypertrophy, independently of voice use, and as seen in the deaf, has recently been exemplified in the hospital practice of my colleague, Mr. Wyatt Wingrave. It is interesting (1) in so far as it corroborates all that has been said as to its general appearance, and (2) that, although much more emphasised anatomically, it is entirely without symptoms—such as pain or cough—directly referable to the region involved.

FIG. CXLVIII.—CHRONIC PHARYNGITIS HYPERTROPHICA.

CASE X.—H. B., æt. 26, had been for some years attending the hospital on account of progressive (dry) catarrh of the middle ear—with entire absence of any tendency to hypertrophy of the pharyngeal tonsil. The mother stated that nine months previously to April 1898 the patient had suffered from a severe attack of influenza cold, since which he had been 'stone deaf.' Whether it was at this time that the pharyngeal lesion under notice had developed, it is difficult to say, for it was only at this time that he came under observation. There is a marked strumous diathesis in the family, and a brother two years younger is afflicted with a similar variety of deafness—without, however, any corresponding pharyngeal manifestation. There was a

doubtful history of congenital syphilis which suggested a possible pre- or post-natal inflammatory process. The picture (Fig. CXLVIII.) almost speaks for itself, but it may be mentioned that the lesion is not only markedly symmetrical and sharply defined, but that its lateral pillars unite to form a perfect arch above the level of the soft palate. The uvula has been somewhat pushed up towards the naso-pharynx to demonstrate its completeness. The tissue was very tough.

Allusion has been made to the influence of **Tobacco** in producing chronic pharyngitis, and the subject has received detailed discussion by me in a separate monograph already quoted. It is of interest to record that Ramon de la Sota, of Seville, describes several varieties of pharyngitis, which he considers as the direct pathological effects of the action of tobacco. They are of three kinds—(1) An *erythema*, occurring for the most part in persons who do not smoke excessively, or who, without smoking, are habitually accustomed to an atmosphere charged with tobacco-smoke. He has often witnessed this appearance in the case of ladies whose fathers, husbands, sons, or brothers are always smoking in their presence—as is the custom in Spain, where one does not deprive himself of his cigar either at table, in the drawing-room, or even in the bedroom. This observation is in direct contradiction to the less practical remark of Cohen, founded, presumably, on less extensive experience, that 'a cause of this kind must be very infrequent in females, even in regions where women smoke.' (2) The *vesicular* form, met with in those smoking strong cigars, and who also chew. This condition is one of some acuteness, lasting about a fortnight, and then returning to a chronic erythema, or proceeding to the more advanced stage. (3) The *granular* form, which is observed not only in inveterate smokers, but in the makers of cigars and cigarettes, who live constantly in an atmosphere saturated with the dust and emanations of the tobacco plant. It is also seen in snuff-takers.

SYMPTOMS: A. **Functional.**—The **Voice** is hoarse, often jerky and altogether beyond control. This is not from any want of power of co-ordination of the laryngeal muscles, nor from any congestion of the vocal cords, which condition may or may not be present, but from spasm of the pharynx, and by irritation of the superior laryngeal nerve from a similar condition of the tensors of the vocal cords. The voice becomes very quickly fatigued, and suffers deterioration the longer it is exercised, so that a clergyman after his third service will hardly be able to speak above a whisper, and will remain quite hoarse for a day or two. Such trouble is more frequent in those subjects who use the voice only occasionally; thus, a clergyman having daily service, or a barrister in full practice, will be less liable to be affected

than he who works the voice on Sundays only, or who makes but occasional harangues. The *singing voice* loses in power at either limit of the register, and is frequently out of tune, a fact of which the patient is conscious.

The special **symptoms** of 'smoker's pharyngitis' are a constant dryness, with persistent desire to clear the throat of a foreign substance and a steady deterioration of voice, which becomes veiled and toneless.

Respiration.—Oral respiration is unaffected, but nasal breathing is often impeded on account of glandular hypertrophy in the vault of the pharynx, and moreover, in a great number of cases, by actual intra-nasal disease. Breath-taking, in use of the voice, is generally described as laborious and painful. Inspiration is often shallow and inefficient, and control of the breath in intonation is inadequate.

Cough is frequent, irritable, and hacking, with expectoration of pellets of mucus from the supra-glottic portion of the larynx, the sputa being marked by occasional streaks of blood from the naso-pharynx. Epistaxis sometimes occurs, and gives marked relief to the local symptoms.

Deglutition.—The patient experiences a frequent desire to swallow, the sensation arising not only from the quasi presence of foreign bodies, but also from an impulse to get rid of accumulated mucus. Pain is experienced in swallowing hot fluids and piquant dishes.

The **senses of smell** and of **taste** are but very slightly affected, even when the disease has extended to the naso-pharynx; nor when the nostrils are obstructed is there often impediment to the odoriferous particles reaching the olfactory 'places,' the respiratory portion of the nasal fossæ being that generally implicated.

Hearing is frequently impaired, from the collection of viscid secretion about the pharyngeal orifices of the Eustachian tubes, and occasionally from extension of the congestion or inflammation to the middle ear.

Pain is by no means a constant or ordinary symptom of chronic pharyngitis, independently of the fatigue experienced on functional exercise, but occasionally the sensation of a foreign body and the discomfort of spasmodic muscular contraction to which I have given the word *pharyngeal tenesmus* is so extreme as to constitute real distress, and to even prevent the patient resting at night.

B. **Physical.**—With regard to the local condition of the surface in this disease, some authors describe it as one of ulceration with

granulations. This is a mistake; there is no ulceration. There is frequent depression, from atrophy of some portions of the submucous tissue, with elevation of other parts from presence of weak granulations, but nowhere is there actual loss of surface tissue. This atrophy of the submucosa is particularly noticeable in the tract leading up to the mouth of the Eustachian tubes (showing as a broad whitish path on either side, Figs. 16 and 17, PLATE II.), the whole of the rest of the surface being covered with granulations of varying sizes.

Colour.—The mucous membrane is always congested, but not always uniformly so; thus it is very common to see only the anterior arch and the lower part of the posterior pillars heightened in colour, while the rest is normal. Where the disease is of long standing, the whole mucous membrane is seen to be traversed with injected capillaries, or the whole surface may be red and the submucous tissue so infiltrated as to greatly interfere with nasal respiration. When the malady has advanced to the granular stage, the posterior pharyngeal wall is seen to be uneven in surface and mottled in colour, with numerous strongly-marked tortuous lines of engorged veins and capillaries, this same varicose condition extending in many cases to the vessels at the base of the tongue. The pillars of the fauces—sometimes anterior or posterior separately, and often both—are usually red, with whitish tracts close to the posterior arch, as above mentioned, leading towards the orifice of the Eustachian tubes. The enlarged glandules appear as red, pale-rose, or yellowish, semi-transparent prominences. The depressions are often covered with frothy saliva or more or less tenacious mucus. It is a point of some practical importance, and not, I think, previously noted, that the anterior pillars are generally the most inflamed when the lesion is associated with certain dyscrasiæ or with faults of assimilation and excretion; the *posterior* when the pharyngitis is due to faults in voice production. When nasal obstruction is responsible, the whole fauces and pharynx, but chiefly the anterior pillars, velum, and uvula, are attacked.

In the dry or atrophic variety, this mucus is often of a brownish or greenish colour (Fig. 15, PLATE II.). In the case of snuff-takers, and in patients exposed to work in atmospheres charged with solid particles, as sweeps, miners, and coal-heavers, the coloration of the back of the throat will be influenced by the dust inhaled.

Form and Texture.—Alterations of form are but of surface character. Deposits, which look like tubercles, are often seen on

the uvula: they are caused merely by retention of the glandular secretion, and are not tuberculous nodules. This condition is illustrated in Fig. 35, PLATE IV. Attention has already been drawn to the thickening behind the posterior pillars in the lateral hypertrophic variety of chronic pharyngitis.

Secretion of the glands and glandules is at first excessive, and there is considerable increase of fluid in the mouth, so that the patient complains that when speaking he does not know how to get rid of his saliva. Very speedily, however, with continuance of stimulation, the ordinary catarrhal changes take place, the mucus becoming more viscid, tenacious, and even muco-purulent. Lastly, in some cases, the glandular tissue becomes worn out, as it were, atrophy of the mucous membrane ensuing, and the throat exhibiting a dry glazed condition, giving rise to the state already described as *pharyngitis sicca* (Fig. 15, PLATE II.). The secretion is in such circumstances so tenacious that it requires forceps to remove it, or free rubbing with a firm and moistened cotton-wool brush; but as these proceedings are likely to lead to hæmorrhage, and possibly to erosions or ulcerations, it is better to soften the desiccated coating by emollient sprays when it is desired to clear it away. When this dryness exists, fœtor of the expired breath is often noticed. This symptom is more especially to be observed when the atrophic process exists also in the naso-pharynx and the nasal fossæ; the fœtor is not necessarily, as was formerly supposed, due to ulceration or to bone-disease, for it may be caused simply by putrescence of the retained secretion. In many cases of *pharyngitis sicca*, not extending to the nasal cavities, there is no mal-odour of the breath. Quite independently of any of these explanations of the mode in which dry throat occurs, it may be laid down almost as an axiom that a patient who awakes in the night with dryness of tongue, mouth, or throat, is the subject of a temporary or chronic obstruction of the nasal passages, and that the discomfort is due to open-mouthed breathing.

C. **Miscellaneous.**—The digestive system is almost always disturbed. Dyspepsia, which is so frequent an accompaniment of pharyngeal disorders, is as much a result as a cause. It is probably due to constant deglutition of disordered mucus favouring the accumulation of flatus in the stomach. But it is probable also that the connection of the glosso-pharyngeal nerve with the vagus may in some measure account for the gastric derangement. Pain and fatigue in breath-taking would also be thus explained, while involvement of the superior laryngeal nerve would account for faults in tension of the vocal cords with consequent inability to pro-

duce high notes. The inequality and impurity of tone experienced in this condition may be accounted for by pharyngeal and naso-pharyngeal lesions, and may be altogether independent of congestion of the larynx. There is, indeed, sometimes a concurrent chronic laryngitis, but in the majority of cases laryngeal congestion does not extend to the covering of the vocal cords or to the ventricular bands.

PROGNOSIS depends first on a correct recognition of the cause and on prompt treatment; secondly, on the determination of the patient to follow out directions as to prevention when a cure by suitable therapeutics has been established. This last is happily not difficult, though the course of treatment is often tedious.

TREATMENT: **Constitutional.**—Encouragement to free secretion from the alimentary canal by mild saline purgatives, such as Friedrichshalle Bitter Wasser, Hunyadi-Janos, or Pullna water, will be found of great value. Iron and vegetable tonics are of use, and may be advantageously combined with aperients. A course of arsenical waters will in many cases be beneficial, especially those of Bourboule, by Mont Dore, which were first brought under notice and prescribed in England by the author for throat affections very many years ago.

Local.—The topical application of astringents and the use of astringent or expectorant lozenges is often of service where the congestion is but slight (Form. 12, 14, 15, and 19), but when there is capillary engorgement with granulations I have seldom found such measures sufficient for the purpose, unless preceded by destruction of the enlarged vessels which supply blood to the hypertrophied lymphoid glandules, these constituting the so-called granulations. On these vessels being divided and obliterated by means of a fine galvano-cautery point, the prominences will be seen within a very short time to shrivel up and disappear; though in obstinate cases it may become necessary to scrape the granulations with a curette. Where the galvano-cautery is not available, the same end may be obtained by incising the vein transversely with a long-pointed knife or lancet, and then applying a fine caustic point, with a little pressure, to the cut spot. When there exist bands of inflammatory hypertrophy, light scoring with the galvano-cautery point will bring about their reduction. Thermal cautery by the Paquelin process, or by wires heated in the fire, is a very inferior method to the galvanic, irritation spreading further beyond the point of application, and the eschar being altogether more 'angry' in character. Many laryngologists advise destruction of the granules by caustic pastes (Mackenzie), by cautery

wires (Michel), or by blunt cautery knives (Reisenfeld). Such a plan does, however, but treat an induced effect, and cannot remove the local pathological cause. Among topical applications recommended by various authors are nitrate of silver, chloride of zinc, chloride of aluminium, sulphate of copper, perchloride of iron, etc. (Form. 57, 65, 56, 58, and 59). Pharyngeal sprays of the same character may also be employed in mild cases, the strength of the solution being not more than a fifth of that employed with the brush. Simple alkaline or emollient applications are to be preferred to mineral astringents; and in many cases great relief to the symptoms and benefit to the diseased condition is afforded by sprays of cold water.

For impairment of the hearing, application of the air-douche by catheter or the Politzer bag will usually be found effectual in clearing away secretion and maintaining patency of the Eustachian tubes. When, however, there is co-existent disease in the naso-pharynx, or a congestion or thickening of the coverings of the turbinated bones, or nasal spurs leading to nasal stenosis, local treatment of the naso-pharyngeal and nasal passages is called for. These points will receive fuller consideration in the chapters devoted to nasal affections.

In very many cases, relaxation of the uvula, brought about by the same causes as the complaint of which such a condition is but a symptom, will continue to keep up or to re-induce local irritation, and must then be effectually treated. This subject will be considered under the special heading of affections of the uvula.

Hygienic.—The principal injunction is to point out how to avoid recurrence. Naturally the first indication is to establish free nasal respiration; and employment during sleep of a 'contra-respirator,' or other apparatus for keeping the mouth closed, a measure warmly advocated by Professor Guye of Amsterdam, will often be necessary to overcome the habit of mouth-breathing at nights, even after the nasal obstruction has been removed. Those who have over-used or abused the voice must be compelled to give it rest for a time, and should be warned that unless they desist from its exercise under unfavourable conditions, a relapse is certain to occur. A few simple lessons in the first principles of respiration in relation to elocution are often most necessary. The use of alcoholic stimulants and tobacco should be interdicted, as well as the taking of condiments, hot spices, etc. Any coexisting diathesis, as the darthous, herpetic, scrofulous, or tuberculous, must receive its appropriate treatment, and a course of waters at Vichy, Mont Dore, Cauterets, or Aix-les-Bains,

according to the existing constitutional condition, may greatly assist in consolidating a cure. In some subjects, in whom the catarrhal influence is strong, it may even be advisable to recommend the patient to pass a winter or two in the South of France, Italy, Algiers, or Egypt. It is necessary, however, to insist with Mandl that such measures are only useful when 'not only the inflammatory phenomena but also the granulations have disappeared.'

Ulceration of the Pharynx.

(*Open out* Plate III. *at end of the Book, during perusal of this Section.*)

Ulceration of the pharynx seldom occurs as the result of a simple angina. It is found, however, as a sequel of the form of pharyngeal inflammation known as hospital sore throat, or as the result of a specific dyscrasia, such as syphilis, scrofula, cancer, tuberculosis, lupus, or leprosy, these causes being operative in the frequency in which they are here enumerated. Finally, ulceration may be the sequel of wounds from sharp-pointed foreign bodies, which have become accidentally lodged in some portion of the tract, or it may be caused by corrosive poisons, scalding fluids, etc., swallowed accidentally or otherwise.

Hospital statistics show that **syphilitic** ulceration of the fauces and pharynx constitutes about $3\frac{1}{2}$ per cent. of all diseases of the throat, and 3 per cent. of those in this particular region. It is manifested in four distinct forms, namely, **primary, secondary, tertiary,** and **congenital** and **hereditary**; though in this last variety the disease commences with practically the same manifestations as characterise the secondary. These will now be considered separately.

Primary Syphilis of the Pharynx.

Buccal and faucial chancres are not uncommon, though rare to individual experiences. Numerous cases have been reported of primary sores on one or other of the tonsils, but only a few behind the posterior faucial pillars, though Krishaber has mentioned an instance of a chancre on the lingual surface of the epiglottis. It is stated that the sores are hard when on the lip or buccal lining, soft on the tonsil—a dictum more arbitrary than rational. The **etiology** is that of direct contact of the part on which the chancre is situated, with a primary sore, or

with some contaminated medium, such as a drinking-cup or feeding-bottle, or with certain trades, as cigar-making, glass-blowing, and many other more or less obvious and direct sources.

CASE XI.—In the case of a surgical instrument maker, under care at our hospital, on account of a primary chancre of the tonsil, the infection could be traced to applying the lips to insufflators and injection tubes which he was repairing.

Diagnosis is often difficult, if the practitioner's attention is drawn to the local lesion before the manifestation of constitutional symptoms. The diseases for which a chancre is most liable to be mistaken are tubercle and epithelioma, both pain and glandular swelling being marked concomitants. Hæmorrhage is rare, and emaciation does not occur as in cancer. **Treatment,** which must be directed on general principles not necessary to be here detailed, will generally clear up any doubts that may arise as to the nature of the ulceration.

SECONDARY SYPHILIS OF THE PHARYNX AND FAUCES (Figs. 20, 21, 22, and 23, PLATE III.).

The fauces and pharynx are sites second only in order of frequency to the skin for manifestations of constitutional syphilis, and this, at least so far as the congenital and secondary are concerned, is due to the fact that this region is morphologically a muco-cutaneous junction. Its rich supply of lymphoid tissue forms another reason for its early selection. Lastly, the fauces constitute the site of greatest friction, and therefore, independently of the tonsils, the point of greatest vulnerability.

Hospital statistics of relative frequency show that the affection of the pharynx, which occurs during that stage of syphilis known as the **secondary,** constitutes about three-sevenths of all forms of syphilitic manifestations in the throat, or rather under 1 per cent. of all throat diseases; and as 5 per cent. of affections of the fauces and pharynx. But this secondary lesion—that is to say, the form of sore throat that occurs, in a period embracing about a year after exposure to the primary infection—is not really an ulceration at all, though there may be, and often is, erosion of the mucous membrane. The condition is looked on by nearly all writers as a manifestation of constitutional disease; but Kaposi states that the papule and the broad condyloma may convey contagion, reproduce their kind, and in the infected individual be followed by secondary symptoms. He believes that in this manner children often become tainted through suckling from nurses who have a papular

syphilide upon the mamma, and that, when thus acquired, the affection of the infant is often mistaken for hereditary disease. I remember such a manifestation in the fauces of an adult patient who had not contracted primary syphilis *in coitû*, but acknowledged to have absorbed the poison by direct contact of the lips with the vulva of an infected person. He stated that he has not, to his knowledge, had a primary sore. I have also seen not a few cases in which mucous patches have been conveyed by ordinary osculation.

CASE XII.—In former editions I have also reported the example of a single lady believed to be the subject of mucous patches, though it was impossible to suppose any existence of acquired infection. Diagnosis was made solely on the objective evidences in the throat (Fig. CXLIX.), and was confirmed by Dr. Lefferts, of New York, and by Mr. Jonathan Hutchinson; but, over five years subsequently, the latter surgeon informed me that there had been the strongest reason to believe that the condition had been induced and kept up factitiously.

FIG. CXLIX.—SIMULATION OF SECONDARY SYPHILIS IN THE FAUCES.

The secondary manifestation of syphilis in the pharynx is characterised by the presence of symmetrical congestive patches (erythema), submucous infiltration, and mucous tubercles, followed by exudation in the form of *plaques*, or by formation of condylomata, on the pillars of the fauces, tonsils, velum, and uvula; similar appearances are found on the lining of the buccal cavity, and on the edges and tip of the tongue. The disease may extend from the fauces and naso-pharynx to the Eustachian tube, and may also be present in the anterior nares; but it seldom attacks the posterior pharyngeal wall.

The *plaques* appear in the pharynx—itself of normal hue, or but slightly congested and swollen—as bright red crescentic or circular blushes, and in the centre of each may be seen a white opaline spot, with an appearance very like that presented by what artists call 'glazing.' As the disease advances, this opaline glaze becomes thicker and greyer, and its surface looks as if it were folded. When appearing on the tonsils, the characteristics of the *plaques* are less marked, as these glands become simultaneously hypertrophied and inflamed, and the products of their secretion, whitish-grey in colour, may cause some confusion. If the disordered epithelial covering of these *plaques* becomes detached, superficial vertical cracks or erosions can be noticed.

Microscopical Appearances.—A secondary syphilitic mucous patch of the tonsil is characterised histologically by a *thickening* of the surface epithelium and infiltration changes in the tissue immediately beneath it.

The swollen and multiplied cells belong to the Malpighian stratum whose lowest layers are much involved by active immigration of lymphocytes, which appear to surround and cut off masses or groups of squames, as shown in Fig. CL.

FIG. CL.—MARGIN OF MUCOUS PATCH ON TONSIL (¼ *in. Obj.*).

Amongst the infiltration tissue which invades the lymph nodules or follicles, are generally found branched and spindle-shaped epithelioid cells, doubtless originating in the vascular endothelium.

The SUBJECTIVE SYMPTOMS of secondary syphilis of the pharynx are often not well marked, and differ but little from those of a common sore throat. The principal sensation is some irritation and pain in swallowing, this last sign varying greatly in different individuals.

OBJECTIVE SYMPTOMS.—The strong diagnostic point in secondary syphilitic manifestations in the pharynx consists in the local evidence of the disease. This is characterised by symmetry of the erythematous or mucous patches; not the symmetry of Moxon, arising from the fact that the throat, in common with the rest of the body, is composed of symmetrical halves, but in many cases by the veritable 'Dutch garden symmetry,' referred to by Jonathan Hutchinson. This is well illustrated in all the figures of this disease in PLATE III.; especially in the first and fourth (20 and 23), where it will be seen that even on the uvula the symmetry of the patches is almost geometrical; and such illustrations are, indeed, not uncommon, but typical.

A peculiarity of this disease, when seen very early in its course, is that the congestion, or at any rate some part of it, is masked, as it were, so that on first view of the throat the surgeon

may be in doubt as to the specific nature of the affection. If, however, the throat be a little irritated by the finger, or with a brush, the distinctive character will at once be intensified, much in the same way as a skin-rash under similar circumstances will be more readily diagnosed by slight surface friction.

The history of the case, and the coexistence of a squamous or roseolous eruption on the skin, will confirm the diagnosis. There is not infrequently considerable rise of temperature on the first approach of this form of sore throat.

The usual period of the first appearance of these secondary manifestations is from six weeks to six months after the primary contagion.

PROGNOSIS is always favourable if the patient can be induced to persevere with treatment. The only complication of a serious character is extension of the disease to the larynx, which leads to a very troublesome form of inflammation with marked and obstinate huskiness of voice.

TREATMENT: **Constitutional.**—Some authorities are of opinion that the cases of syphilis in which the secondary manifestations are most severe are least prone to suffer from later ravages. As far as the throat is concerned, there can be but little doubt that this later immunity is in proportion to the efficacy and persistence of treatment during the earlier stages of the disease. Especially is this the case if a mild mercurial course, never reaching beyond the verge of salivation, is pursued concurrently with local measures. The tendency to ptyalism is much diminished if the patient is directed to carefully cleanse his teeth with more than usual vigilance, and especially after each meal, and if he uses freely a detergent mouth-wash or gargle (Form. 2, 6, 8, 9, and 11). Solutions of chlorate of potassium (Form. 8) have proved superior in my practice to those of alum salts in favour at Aix-la-Chapelle; and thorough cleansing of the teeth with a soft brush is insisted on by me as an important preventative of extension of the disease by local irritation. My favourite form for the administration of mercury at this stage of syphilis is in 5-grain doses of the compound calomel, or Plummer's pill, twice or thrice daily. For some twenty years I have administered a somewhat similar combination of mercury in an effervescing lozenge, each one of which contains a small amount of grey powder and tartar emetic (Form. 13). In this view as to the importance of mercurial treatment I am supported by most syphilographers; and Morell Mackenzie probably stands alone among throat-specialists in considering that 'secondary syphilitic affections of the

pharynx do not usually require any constitutional remedies.' It only remains to be added that in very rare instances mercury is not well borne when taken internally. Where this is the case, the patient is generally possessed of a scrofulous or tuberculous taint, and iodide of iron or of sodium, with cod-liver oil, will be preferably indicated. It is seldom even in these conditions that the system does not respond beneficially to mercurial inunction; and this method of medication has also been recommended in previous editions, for those obstinate cases that resist the drug as ordinarily prescribed.

Local.—This consists essentially in frequent caustic or resolvent applications, limited to the exact area of each area of erosion or mucous patch. In some cases iodine is of service, in others sulphate of copper is efficient. Iodoform has also been recommended, but offers no advantage over other applications sufficient to counteract its nauseative effects and disagreeable odour; it is now replaced in my practice by Iodol, which is similar in constitution, and, though less powerful, is inodorous. My experience, however, leads me to rely almost solely on the use of nitrate of silver in the solid form, applied accurately to each diseased patch each day or alternate day. Even after all spots are healed, the patient should be carefully examined once or twice a week, and be treated with renewed energy on the recurrence of the slightest relapse. Where there are cracks or erosions, and in the somewhat rare cases in which pain accompanies a 'secondary' sore throat, I have usefully substituted iodine and carbolic acid (Form. 61) as a local pigment. Where there is pain from extension to the ear, with deafness, inhalations (Form. 30, 31 and 32), used as described at page 146, are beneficial; whilst when the mucus in the nares is apt to become inspissated, emollient applications (Form. 83 and 85) and nasal douches may be called for (Form. 74, 75, 76, 78, and 80).

It is important to note that operations, such as excision of an enlarged tonsil, or ablation of an elongated uvula, should not be performed during the course of secondary manifestations in this region, since the raw surface is almost sure to take on afresh the diseased condition.

Dietetic and Hygienic.—The diet must be non-irritating, and, both on general and local grounds, all influences calculated to induce catarrh must be guarded against. Warm baths, with free use of soap, and Turkish baths, are useful aids towards elimination of the poison. Smoking should always be interdicted. Too much care cannot be enjoined against the possibility of communicating

the contagion to others, not only by direct contact, but by drinking vessels, towels, and the like.

Tertiary Syphilis of the Pharynx and Fauces (Figs. 24, 25, and 26, Plate III.; and Figs. 18 and 19, Plate II.).

The **relative frequency** of the tertiary form of syphilis, which occurs in the pharynx at a period of from two to five years up to any length of time after primary infection, represents nearly a half of all syphilitic manifestations in the throat, over 1 per cent. of all throat diseases; and as nearly 2 per cent. of affections of the fauces and pharynx.

The tertiary lesion is characterised by true ulceration or loss

Fig. CLI. — Tertiary Ulceration of Soft Palate and Pharyngeal Wall; Perforation of Right Faucial Pillar.

Fig. CLII. — Tertiary Syphilis; Central Perforation of Hard and Soft Palate.

of tissue, and is, according to modern views, always the result of degeneration of gummatous deposit. The ulceration may be conveniently considered, as in the tongue, under two types, the **superficial** and the **deep**. The superficial variety seems to commence in the lymphoid surface tissue, and is often confined to one spot, or there may be several ulcers at the same time, which for the most part sooner or later unite (Fig. CLI.). In the earlier stages, ulceration is generally limited to the anterior pillars of the fauces, especially at their junction with the tongue, to the uvula, and particularly to the velum.

This last-named part, being of soft, loose structure, and bounded on both sides by mucous membrane, offers little resistance to destructive changes, and yields rapidly to the inroads of the disease. In this situation, a red boggy patch is often seen

on the buccal surface, which will, if unchecked, speedily lead to perforation. In such a case the ulceration has commenced on the posterior surface of the soft palate, and may often be seen and treated by the help of the posterior rhinoscopic mirror before perforation has taken place. Ulceration also occurs, generally in the median line, either at the junction of the soft and hard palate, or over the hard palate itself; it may also often be found just behind the upper incisor teeth.

In the deeper variety the necrosis commences also as a gumma of a more definite and circumscribed character. When it attacks the tonsil it causes considerable enlargement of the gland; this eventually breaking down involves the surface epithelium, and forms a deep excavating single ulcer, whose histological characters differ but slightly in degree from the superficial form. Clinically, however, these deep ulcers are responsible in a higher degree for the characteristic distorting cicatrices.

CASE XIII.—The accompanying drawing, Fig. CLII., represents a central perforation, the result of recrudescence of specific inflammation, and was taken in February 1879, from the throat of a patient, æt. 25, who had formerly been a private in the Grenadier Guards, and had contracted primary syphilis five years previous to coming under my notice. In the latter part of 1877 his palate and nasal bones became diseased, and 'eleven separate pieces of bone' had been extruded. His present attack had existed for five weeks before his visit. There was but slight facial deformity, but through the nostrils, which communicated with the palatal opening, and were ulcerated, roughened bone could be felt with the probe.

It is seldom that the posterior wall of the pharynx is attacked by ulceration earlier than five years after the first infection; but I have seen a few cases in which the primary infection had occurred less than three years previously. When the ulcer has once formed, it spreads rapidly, and its secretion, composed chiefly of epithelial detritus and pus cells, possesses highly septic properties. The ulcers, which may be round or irregular in shape, are bounded by a deep red halo, probably caused by the escape of colouring matter of the blood from compression of the vessels by cell-infiltration. When the tongue is ulcerated, the ulcer is usually in the median line, or in the form of a longitudinal fissure. As the ulcers heal, the surface assumes a peculiar bluish glazed appearance. In both secondary and tertiary syphilis a complaint is often made that the tongue feels too large for the mouth, and on examination the organ will be frequently seen indented by the teeth. Ulcers of the edges of the tongue are often excited by irritation of decayed dental stumps.

Microscopically, when the ulceration is comparatively **superficial,** the usual small-cell tissue is seen mixed with epithelial

branched cells, containing large oval nuclei. The blood and lymph vessels are much thickened, owing partly to multiplication of the endothelial and perithelial cells. The perivascular lymph spaces and capillary lymphatics are distended with lymphocytes, the last-named giving in section the appearance of 'tubercles.' The new small-cell tissue invades the surface epithelium, which disappears, leaving the floor of the ulcer composed of dense and lowly vascular granulation tissue covered with pus cells. As ulceration ceases, 'fibrosis' of the deeper part follows with well-marked 'arteritis obliterans.'

Fig. CLIII. represents a section taken at the edge of a superficial ulcer; fibrotic or cicatricial changes are well shown in its deeper part; the lymph nodules seem to have escaped the small-cell infiltration, which has reached the surface and has destroyed the epithelium.

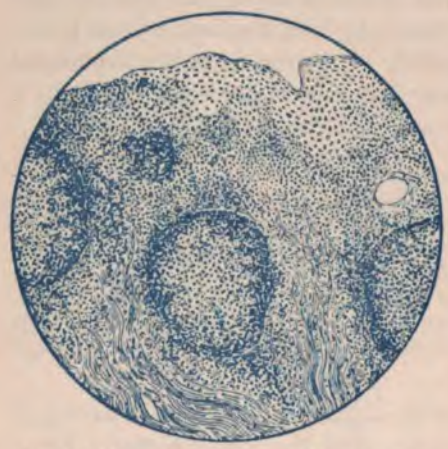


FIG. CLIII.—EDGE OF TERTIARY ULCER OF TONSIL (½ *in. Obj.*).

The SUBJECTIVE SYMPTOMS of this disease are frequently not very well marked when the pillars of the fauces only are involved, since pain, at least in proportion to the mischief, is but seldom experienced; when, however, there is perforation of the palate, or the velum or uvula sloughs away, a characteristic result is impairment of voice. This is due to loss of power to shut off the mouth from the naso-pharynx during articulation. From the same cause the greatest inconvenience is experienced in swallowing fluids, which pass into the nasal cavity and are ejected at the nostrils. When the posterior wall of the pharynx is attacked, the ulceration may commit most fearful ravages, extending upwards into the nasal fossæ and downwards to the epiglottis. It may be noted, however, that syphilitic ulceration attacks the larynx, except perhaps the epiglottis, at a much later period than it does the pharynx.

DIAGNOSIS.—The history of the case, the post-cervical glandular enlargement, the absence of sympathetic induration of the parotid, submaxillary or anterior cervical glands, the comparative freedom from pain, and, above all, the amenity of the disease to

appropriate remedies, will distinguish it from cancer, the only malady with which it is likely to be confounded.

PROGNOSIS.—This is almost invariably favourable under suitable treatment perseveringly employed, although the patient may have been reduced, as often happens, to extreme emaciation. A co-existent scrofulous diathesis is, however, most obnoxious to the success of remedial efforts. The danger of hæmorrhages and of necroses of bone in the acute stage, and of cicatrisation, leading to adhesions and stenoses, as sequelæ, must not be forgotten when forming a prognosis. These adhesions sometimes give rise to very grotesque appearances, one of which is illustrated in the accompanying figures (Fig. CLIV.). Another may be seen in the coloured illustration (Fig. 19, PLATE II.).

TREATMENT.—I attach the greatest importance to the com-

FIGS. CLIV. — ADHESION OF UVULA TO FAUCIAL PILLARS, SHOWING DIFFERENCE OF APPEARANCE IN STATE OF REPOSE AND OF CONTRACTION ON INSPIRATION. A FRESH ULCER CAN BE OBSERVED IN THE SITUATION OF LEFT TONSIL.

bination of general and topical measures, neither of them alone being efficient.

Constitutional.—This will consist in the administration of iodide of potassium in 3-grain to 10-grain doses during active ulceration. Some patients are peculiarly susceptible to the action of iodine when combined with potassium. It has, however, been noticed—I think, by Mr. Hutchinson—that where this is so, the desired effect is obtained with very small doses of the drug, and it is in any case wise to commence with small doses and to gradually increase them. If in such cases the tendency to coryza be not counteracted by the addition of ammonia or of tincture of nux vomica, iodide of sodium should be substituted. The atomic weight of sodium being less than that of potassium, a smaller dose of the former may be administered. Certainly all sodium salts are less depressing than those of potassium.

When the acute attack is past, the prolonged exhibition of perchloride, biniodide, proto-iodide, or bicyanide of mercury, in small doses, is all-important as a tonic, and as a prophylactic against future relapses (Form. 91 and 103).

Local.—Formerly I was in the habit of treating all these tertiary ulcerations by the daily local application of nitrate of silver, of acid nitrate, or cyanide of mercury, or of sulphate of copper, the first-named being preferred; and such a plan I would still recommend under the opportunities ordinarily available in general practice. I have, however, met with such marked success, both as to rapidity of cure and freedom from recurrence, from the employment of the galvano-cautery, that this measure has largely superseded the use of the mineral caustics in my practice.

Whatever application be made, care must be taken to thoroughly cleanse the surface of the ulcerations from any secretion covering them before the local remedy is applied.

Gargles of permanganate of potassium, chlorate of potassium, chinosol, and carbolic acid, all aid in keeping the mouth free from accumulation of muco-purulent deposit (Form. 9, 8, 78, and 2). Ice also is frequently most grateful.

Local treatment must be pursued with the same constancy and persistence as in the secondary form of the disease, and success in these cases depends as much on the perseverance of the patient as on the energy of the medical attendant.

In spite, however, of every care, relapses will from time to time occur, and in process of years mercury will be found to have lost its effect. In these circumstances the Zittmann treatment may be advantageously adopted.

It is to be remembered that in the healing of these pharyngeal ulcerations, cicatrisation, with much hyperplasia, is occasionally followed by contraction and constriction of the pharynx, for the dilatation of which mechanical or surgical measures may be advisable. And on this account it may be noted that no morsel of tissue, be it ever so lightly attached, should be separated by the knife; for it is impossible to say how useful this small atom may be, as a starting-point for healthy action, when the reparative process is once set up.

In some instances, fragments saved from the destructive ulceration become hypertrophied and appear as distinct new growths (Figs. 25 and 26, PLATE III.; and Fig. 19, PLATE II.).

Whenever cicatrisations lead to adhesion of the soft palate to the wall of the pharynx, or to one side or other of the fauces,

nasal respiration is obstructed, the sense of smell is impaired, the patient experiences great difficulty in clearing the nasal passages, and a disagreeable tone of voice is but too frequently a permanent witness of his malady.

CASE XIV., which is typical of many, occurred at the Central Throat and Ear Hospital, in which adhesive contraction took place of the tissues of the pharynx, fauces, and root of the tongue, just above the level of the epiglottis. This led to an annular stricture, which barely admitted a goose-quill. Some relief to the consequent dysphagia was afforded by division with a galvano-caustic knife and frequent passage of the bougie, but the patient left hospital before any definite benefit was obtained.

When loss of tissue of the palate has been considerable, it is often necessary for the patient to wear some form of obturator. In all cases when the ulceration is healed, a more or less distinct and permanent stellate cicatrix is formed, as shown in Fig. CLV., and in Figs. 25 and 26 on PLATE III.); this often proves of great diagnostic importance, when in the later history doubt might possibly arise as to the nature of some form of laryngeal mischief. Unhealed perforations (Fig. 18, PLATE II.) are equally significant.

FIG. CLV. — ACTIVE TERTIARY ULCERATION OF PHARYNX WITH OLD SCAR FORMATION.

Dietetic. — Pain in deglutition is not usually a prominent symptom in tertiary syphilis affecting the pharynx. Most patients, therefore, while requiring to take food of a semi-solid character, or, in cases of perforation of the palate, liquids previously thickened, do not need, as a rule, to be restricted in their dietary, except so far as the general prohibition of condiments and of fluids at high temperature (so frequently insisted upon in these pages), extends.

CONGENITAL AND HEREDITARY SYPHILITIC ULCERATION OF THE PHARYNX (Fig. 27, PLATE III.).

The **relative frequency** of hereditary lesions of the throat is as 5 per cent. of all forms of syphilitic manifestations in the throat, or 0.15 per cent. of all throat diseases, and as nearly 5 per cent. of all faucial and pharyngeal maladies. Congenital or hereditary syphilis may make itself evident in the pharynx at

When the acute attack is past, the prolonged exhibition of perchloride, biniodide, proto-iodide, or bicyanide of mercury, in small doses, is all-important as a tonic, and as a prophylactic against future relapses (Form. 91 and 103).

Local.—Formerly I was in the habit of treating all these tertiary ulcerations by the daily local application of nitrate of silver, of acid nitrate, or cyanide of mercury, or of sulphate of copper, the first-named being preferred; and such a plan I would still recommend under the opportunities ordinarily available in general practice. I have, however, met with such marked success, both as to rapidity of cure and freedom from recurrence, from the employment of the galvano-cautery, that this measure has largely superseded the use of the mineral caustics in my practice.

Whatever application be made, care must be taken to thoroughly cleanse the surface of the ulcerations from any secretion covering them before the local remedy is applied.

Gargles of permanganate of potassium, chlorate of potassium, chinosol, and carbolic acid, all aid in keeping the mouth free from accumulation of muco-purulent deposit (Form. 9, 8, 78, and 2). Ice also is frequently most grateful.

Local treatment must be pursued with the same constancy and persistence as in the secondary form of the disease, and success in these cases depends as much on the perseverance of the patient as on the energy of the medical attendant.

In spite, however, of every care, relapses will from time to time occur, and in process of years mercury will be found to have lost its effect. In these circumstances the Zittmann treatment may be advantageously adopted.

It is to be remembered that in the healing of these pharyngeal ulcerations, cicatrisation, with much hyperplasia, is occasionally followed by contraction and constriction of the pharynx, for the dilatation of which mechanical or surgical measures may be advisable. And on this account it may be noted that no morsel of tissue, be it ever so lightly attached, should be separated by the knife; for it is impossible to say how useful this small atom may be, as a starting-point for healthy action, when the reparative process is once set up.

In some instances, fragments saved from the destructive ulceration become hypertrophied and appear as distinct new growths (Figs. 25 and 26, PLATE III.; and Fig. 19, PLATE II.).

Whenever cicatrisations lead to adhesion of the soft palate to the wall of the pharynx, or to one side or other of the fauces,

A peculiarity in these ulcerations is their centrality of position, and, furthermore, their special tendency to attack the bone and to eventuate in caries and necrosis (Fig. CLVII.). The ravages of the disease present the typical appearances that are found in the tertiary syphilis of the adult. The œsophagus is but very rarely attacked. It is with hesitation that I venture to differ from John N. Mackenzie on a clinical point in connection with this subject, but I can hardly agree 'that the invasion of the larynx may be looked for with the same confidence in the congenital as in the acquired form of the disease.' It is quite true that laryngeal manifestations occur occasionally without evidence of pre-existing pharyngeal lesions, but my experience tends to the view that, as a rule, the ulceration of congenital syphilis is limited to the palato-pharyngeal and naso-pharyngeal tissues, and that laryngeal mischief is a comparatively rare sequel. Almost needless to say that this rarity is enhanced in proportion to the vigour and perseverance of treatment in the earlier stages of the disease.

FIG. CLVII.—ULCERATION OF VELUM IN CONGENITAL SYPHILIS (CASE XVI.).

A point of much clinical interest and importance, which has occupied the attention of Continental syphilographers, and has been elucidated in its special application to the throat by John N. Mackenzie, is the influence of some of the ordinary infectious diseases of childhood upon the progress of the inherited syphilitic affection. Sufficient evidence has been adduced to warrant us in saying (1) that while congenital syphilis affords no absolute protection against certain acute infectious diseases,—and an example has just been given in Case XVII.,—its existence in the individual seems often, other things being equal, to mitigate their severity and to exert a favourable influence on their course; and (2) that certain acute diseases, accompanied by an exanthem—as, for example, scarlatina and measles — favour the dissipation, at least temporarily, of the pharyngeal and other manifestations of syphilis. On the other hand, with regard to diphtheria, when this affection supervenes during the existence of syphilitic lesions in the throat, the patient is liable to rapidly succumb.

SYMPTOMS.—Beyond the character of the ulceration, there are

other local signs which make the diagnosis comparatively easy in the case of infants. The chief are: impediment to nasal respiration and inability to take the breast; with coryza, leading to excoriations and ulcerations of the skin and of the alæ of the nose and the lips. In addition, there are the general cutaneous manifestations well known to every practitioner.

PROGNOSIS is greatly influenced by the age at which the patient is attacked. The earlier the manifestation, the more serious are the results. Pharyngeal ulceration occurring within the first year of life is almost invariably fatal. Notably disfiguring injuries to the palate, nose, and skin are often witnessed in those who survive.

In the majority of cases of deafness arising from inherited disease, the affection doubtless invades the internal ear; but experience would seem to indicate that in many cases of even extreme deafness, coming on concurrently with pharyngeal ulceration, the aural trouble is confined to the middle ear, and is a direct extension of the pharyngeal mischief. In such a case, inhalations, Politzer inflation, and other remedies directed to the tympanic cavity, may succeed in removing the deafness after the pharyngeal ulcer is healed. It is important to remember this, since surgeons are too apt to look on all cases of syphilitic deafness as hopeless. Of course it is quite possible that middle-ear inflammation and cochleitis may coexist.

TREATMENT.—The **general** treatment must, so far as circumstances permit, be carried out upon the same lines as recommended in the acquired form of the disease. Remembering, however, how much better children bear mercury than do adults, this drug may with advantage be administered with proportionately greater freedom. The best form is that of grey powder. Moderate inunction is also well tolerated. After the first few years of life, iodide of sodium with iodide of iron is a most efficient remedy.

I lay great stress on **local** treatment on children, even the youngest, by nasal douches administered twice or thrice a day, and always before attempts at suckling, by means of the nasal syringe (Fig. CVIII.), or spray (Fig. CVII.). The best solutions are those of chlorate of potassium, borax, and chinosol (Form. 74, 78, and 75). The after-application of an ointment of vaseline and eucalyptus oil (Form. 83), of iodol (Form. 85), or of boracic acid, with the addition of red oxide of mercury ointment (1 to 16 parts), has in my hands been of more service than swabbing the passages of the nose and throat with caustics. In no circumstance do I employ nitrate of

silver in infants — first, because I have seen two cases in which a prolonged course of such applications has resulted in permanent discoloration of the skin; and, secondly, because nitrate of silver locally applied has a decided tendency to favour the hyperplasia which is already a sufficiently marked sequel of all specific ulcerations. In two instances of threatened destruction of the nose, I have seen the galvano-cautery arrest ulceration, where every other measure appeared to be useless.

Dietetic.—Of the greatest importance is the nourishment of children who are the subjects of syphilis; and Cohen urges, with correctness, that a healthy wet-nurse should be procured, though 'a syphilitic wet-nurse is admissible, provided she is placed under specific treatment—that is is to say, mercurialised.' If a child cannot suckle, no time should be lost in feeding it by the spoon, care being taken not to give the milk of such a strength as to endanger digestion.

Hygienically, the syphilitic infant requires the greatest care in the way of warm baths, warm clothing, etc.

Scrofulous Ulceration of the Pharynx (Fig. 41, Plate V.).

Scrofulous pharyngitis is described by Isambert and others as a quite distinct form of disease; but I must confess to never having seen a case in which there were present the symptoms described by these authorities, unless there was also a concurrent syphilitic or tuberculous dyscrasia. Many so-called cases of scrofula of the pharynx are undoubtedly due to lupus. I am gratified to find that this disbelief of uncomplicated scrofulous ulceration, which I expressed in my first edition, is shared by such accurate observers as Schech, E. Wagner, and John N. Mackenzie. The last writer affirms that 'there is no just ground for belief in an ulcerative scrofulide of the throat. It needs only the most superficial review of the writings of those who maintain its separate existence, to show the utter confusion which prevails as the result of erroneous views, handed down among the traditions of an obsolete pathology.'

To prevent misunderstanding, it may be as well to state that I do not deny a specific manifestation of scrofula in the pharynx; I only affirm that it is not usually one of ulceration. The form in which I have seen it exemplified is that of a low type of inflammatory thickening of the fauces, of the naso-pharyngeal passages, of the nasal septum, of the glands in the vault of the

pharynx, and of the faucial tonsils, accompanied not infrequently by a similar condition of the neighbouring lymphatic glands, which often undergo disintegration. There is also occasional necrosis of the turbinated bones.

While admitting that syphilis, if transmitted, must produce syphilis, it is quite certain that this disease, when manifested in a subject tainted with scrofula, has certain symptoms superadded. In such a case the local manifestations appear to arise in the glandules, which are hypertrophied and are liable to ulceration. The ulcerations are at the commencement superficial and indolent, but sooner or later perforation takes place, and many characteristics of a true syphilitic ulceration are presented, with others superadded. When remedial measures are applied, it is found that the disease does not respond, as might be expected, to the measures applicable to either scrofula or syphilis separately. And here I may be allowed to adopt the words of Sir James Paget: 'I would not venture to call the disease that may occur in a scrofulous person become syphilitic a hybrid one, and yet perhaps the term is not altogether wrong; but at least I would call it a mixed disease, and hold that syphilis inserted in a scrofulous person will, in its tertiary period, produce signs which it may be very hard to distinguish from scrofula—signs in which the characters of scrofula and of syphilis are mingled, and (which is very important) which require that the treatment of scrofula should be combined with the treatment of syphilis, in order to produce a fully successful result.'

A throat of this nature is depicted in Fig. 41, PLATE V.

CASE XVIII.—The drawing was taken from a female patient infected with syphilis when pregnant with her first child some five years previously. She had had three or four miscarriages, but had not given birth to a living child. She was of a strongly marked strumous habit, and bore scars in her neck of glandular abscesses when a child. The ulceration was markedly tuberculated, and might be considered as almost lupous. There was, however, a clear history of syphilis, and no other evidence of lupus.

TREATMENT.—In accordance with the opinion given as to the hybrid nature of these cases, iodide of potassium should be combined with iodide of iron. Good food, fresh air, and phosphorised cod-liver oil are also indicated. Sea-air and sea-bathing, and especially the bromo-iodine water of Woodhall Spa, Kreuznach or Challes, both internally, locally, and in baths, will be found very efficacious.

The galvano-cautery is particularly valuable in destroying this form of ulceration; curettage and lactic acid are of service when there is much nodulation.

Tuberculous Ulceration of the Mouth, Fauces, and Pharynx (Figs. 102 and 103, Plate XI.).

It is to Isambert and Fränkel that we are indebted for the original description of this rather unusual affection, and for insistence on the important points of differential diagnosis necessary for its recognition. Since attention was thus drawn to the disease, and its true nature defined, much attention has been given to it by various observers, so that our present knowledge of tuberculous lesions in the regions now to be considered is fairly complete and exact.

Etiology and Pathology.—Specific ulcerations, as manifestations of tubercle in the mouth, fauces, and pharynx, are much more rarely witnessed than in the larynx. But as to the exact frequency, authors vary considerably. According to Heinze, tubercle was found in the pharynx fourteen times in 1226 cases of pulmonary tuberculosis. This estimate approximately agrees with that of Guttmann and Lublinski, who believe that only 1 per cent. of tuberculous patients are affected with its occurrence in the palate and pharynx. On the other hand, Willigh noted only one case in the pharynx out of 1317 collected cases of general tuberculosis. Personally, my clinical experience inclines me to agree with the estimate of Heinze and Guttmann. Tuberculous manifestations occur in the larynx in from 25 to 30 per cent. of all cases of pulmonary phthisis; and the number of such cases which have come within my scope of observation since my attention was more particularly drawn to the subject, by the articles of Fränkel and Isambert, may at a low estimation be placed at 2000. I have not, however, in my own practice, seen more than twenty cases with pharyngeal, buccal, or lingual manifestations, representing their occurrence in about .33 to .25 per cent. of all forms of tuberculosis of the air passages, and about 1 per cent. of those exhibiting laryngeal complications.

Although there was formerly a general tendency—to which individually I plead guilty—to view all ulcerations in this region as syphilitic, it is not likely that, with present information, this mistake is now made by specialists; and I agree with Guttmann that it is not probable that these cases are now overlooked, for the twofold reason that the extreme pain experienced by the patient at once enforces our attention to the local cause, and because, as a rule, tuberculous ulceration is a late evidence of the general disease. As to this last fact, however, there is some

difference of opinion. I have reported, in conjunction with Dundas Grant, two cases in which the first manifestation in the mouth and fauces had occurred between two and three years previous to any chest attack, or even to the suspicion of pulmonary disease. To these, the following is of sufficient interest to be added:—

CASE XIX.—Matilda H., æt. 20, married at 16, is the mother of three children, of whom the youngest is fourteen months old, and is 'just being weaned.' She herself was an only child, and was born when her father, who is still living, was only nineteen. Her mother died before she could remember. The patient applied at the hospital on November 15, 1886, on account of pain just at the entrance to the gullet. No pain was experienced in the fauces, but the distress was so extreme lower down that she 'would rather not swallow so as not to have the pain.' There was slight hacking cough, worse at night; and but little alteration of voice. The *fauces* were seen to be of characteristic paleness, and on the left tonsil, on careful inspection and with bright light, there was discovered slight creeping ulceration of a very superficial character, and with but scanty secretion. The tonsils were not in the least enlarged, nor were the anterior pillars of the fauces attacked by the ulceration. The back of the mouth was full of frothy saliva, which was in itself a source of distress, as the clearing of it was almost as painful as its removal by swallowing. The *larynx* was healthy as to epiglottis and vocal cords, but the coverings of the arytenoids were very congested, and there was slight thickening of the inter-arytenoid commissure. The posterior wall of the *pharynx* was seen, both by oral and laryngeal examination, to be ulcerated. The appearance of the ulceration was quite distinctive from that of either syphilis or cancer, and was characterised by the presence of large masses of weak, pale granulations. There was no enlargement of cervical glands in any direction, and no part pointing to any other diagnosis than that of tuberculosis. The *stethoscope* revealed nothing more than slight harshness of respiration, and there was somewhat impaired resonance at the right apex. There had been no distress of breathing, and neither night sweats nor diarrhœa. She had never had any illness affecting her chest or lungs. Some of the granulations were scraped away and submitted to microscopic examination, with the result of showing numerous bacilli of tuberculosis.

Isambert has given one case of a child, æt. four and a half years, in whom there were typical objective signs of pharyngeal tuberculosis, without any pulmonary symptoms whatever. Fränkel's paper also contains records of cases which are adduced to support his theory that miliary tuberculosis of the pharynx is a disease which may attack apparently healthy persons, though it can hardly be admitted that his cases entirely support his thesis. Bosworth is inclined to the same opinion as Fränkel, that the disease is frequently primary; but in the only case quoted by him, 'examination of the lungs showed marked dulness, with broncho-vesicular respiration in the right interscapular region, eight weeks after the first symptom of throat trouble was manifest, and four weeks after the graver form of the disease of the fauces had set in.' On the other hand, the following case is a striking exemplification of the more general view that pharyngeal ulceration is a late evidence of tuberculosis:—

Case XX.—J. J., æt. 35, was admitted into the Central Throat and Ear Hospital, September 9th, 1886, on the recommendation of Mr. Wade of Southampton. Although he had, on a previous occasion, eight or ten years ago, lost his voice for a time, his present illness only dated from September 1885. It commenced with a severe cold in the head, followed by hacking cough and slight expectoration of thick phlegm, which was only freed after attacks of cough lasting for an hour, after which he would have rest for two or three hours. He lost his voice for eight or ten days, but almost entirely recovered from the illness in three or four weeks. All the symptoms returned at Christmas 1885, and have not since subsided. From this date he has lost flesh. Pain and difficulty of swallowing were first noticed in March 1886; about this time he gave up work, and though he has done a little off and on he has been an invalid ever since that time. Diarrhœa occurred in August. He never spat blood, nor had night sweats. There was no history of syphilis. He had been married nearly four years, and his wife had given birth to two healthy children, and had had no miscarriage.

With the laryngoscope there were seen characteristic thickening of the arytenoid cartilages and vocal cords, but there was no ulceration or inflammation of the fauces or soft palate. Examination of the chest revealed feeble expansion, increased vocal fremitus, dulness, and tubular breathing at the right apex.

The patient was directed to wear an oro-nasal inhaler with the inhalant in Form. 49, and to take hypophosphites with Fowler's solution; liquid applications or insufflations of chloride of zinc and morphia (Form. 66 and 69) were employed daily. Under this treatment he decidedly improved; but on October 5th a shallow ulcer was observed on the left tonsil about the size of a threepenny-piece, which was judged to be tuberculous, though it did not cause pain, that symptom being manifested only at the orifice of the œsophagus. The ulcer healed after one application of the galvano-cautery on October 7th, cocaine having been previously used to mitigate the pain of that procedure.

An essential element in the etiology is obviously the activity of the tubercle bacillus, as is more particularly described in connection with laryngeal tuberculosis (Chapter XXIII.). The predisposing cause of the infection is often more difficult of determination, but there is the invariable element of a low state of vitality, with a resulting feebleness of recuperative power. Its occurrence as a primary manifestation of the tuberculous diathesis is at least as doubtful, but still as possible, as is that of a primary tuberculous laryngitis. All arguments to this effect are met by the fact that no case is recorded of a patient dying with either disease, in which the lungs have been found healthy; and in this connection we can but admit that the ear is less likely than the eye to detect early manifestations. My own belief is in accord with that of Schech, who has been forced to the conclusion that the pharynx is only *apparently* attacked primarily; in other words, that prior to the outbreak of pharyngeal tuberculosis, tuberculous deposits already exist in other organs, although the fact cannot always be demonstrated. But with the records of such observers as have been named, and in recollection of our own cases, it would be rash to assert that a primary tuberculous ulceration of the pharynx is impossible. Admitting so much, many local causes of a functional character may be quoted as exciting to the malady.

When the acute attack is past, the prolonged exhibition of perchloride, biniodide, proto-iodide, or bicyanide of mercury, in small doses, is all-important as a tonic, and as a prophylactic against future relapses (Form. 91 and 103).

Local.—Formerly I was in the habit of treating all these tertiary ulcerations by the daily local application of nitrate of silver, of acid nitrate, or cyanide of mercury, or of sulphate of copper, the first-named being preferred; and such a plan I would still recommend under the opportunities ordinarily available in general practice. I have, however, met with such marked success, both as to rapidity of cure and freedom from recurrence, from the employment of the galvano-cautery, that this measure has largely superseded the use of the mineral caustics in my practice.

Whatever application be made, care must be taken to thoroughly cleanse the surface of the ulcerations from any secretion covering them before the local remedy is applied.

Gargles of permanganate of potassium, chlorate of potassium, chinosol, and carbolic acid, all aid in keeping the mouth free from accumulation of muco-purulent deposit (Form. 9, 8, 78, and 2). Ice also is frequently most grateful.

Local treatment must be pursued with the same constancy and persistence as in the secondary form of the disease, and success in these cases depends as much on the perseverance of the patient as on the energy of the medical attendant.

In spite, however, of every care, relapses will from time to time occur, and in process of years mercury will be found to have lost its effect. In these circumstances the Zittmann treatment may be advantageously adopted.

It is to be remembered that in the healing of these pharyngeal ulcerations, cicatrisation, with much hyperplasia, is occasionally followed by contraction and constriction of the pharynx, for the dilatation of which mechanical or surgical measures may be advisable. And on this account it may be noted that no morsel of tissue, be it ever so lightly attached, should be separated by the knife; for it is impossible to say how useful this small atom may be, as a starting-point for healthy action, when the reparative process is once set up.

In some instances, fragments saved from the destructive ulceration become hypertrophied and appear as distinct new growths (Figs. 25 and 26, PLATE III.; and Fig. 19, PLATE II.).

Whenever cicatrisations lead to adhesion of the soft palate to the wall of the pharynx, or to one side or other of the fauces,

nasal respiration is obstructed, the sense of smell is impaired, the patient experiences great difficulty in clearing the nasal passages, and a disagreeable tone of voice is but too frequently a permanent witness of his malady.

CASE XIV., which is typical of many, occurred at the Central Throat and Ear Hospital, in which adhesive contraction took place of the tissues of the pharynx, fauces, and root of the tongue, just above the level of the epiglottis. This led to an annular stricture, which barely admitted a goose-quill. Some relief to the consequent dysphagia was afforded by division with a galvano-caustic knife and frequent passage of the bougie, but the patient left hospital before any definite benefit was obtained.

When loss of tissue of the palate has been considerable, it is often necessary for the patient to wear some form of obturator. In all cases when the ulceration is healed, a more or less distinct and permanent stellate cicatrix is formed, as shown in Fig. CLV., and in Figs. 25 and 26 on PLATE III.); this often proves of great diagnostic importance, when in the later history doubt might possibly arise as to the nature of some form of laryngeal mischief. Unhealed perforations (Fig. 18, PLATE II.) are equally significant.

FIG. CLV. — ACTIVE TERTIARY ULCERATION OF PHARYNX WITH OLD SCAR FORMATION.

Dietetic. — Pain in deglutition is not usually a prominent symptom in tertiary syphilis affecting the pharynx. Most patients, therefore, while requiring to take food of a semi-solid character, or, in cases of perforation of the palate, liquids previously thickened, do not need, as a rule, to be restricted in their dietary, except so far as the general prohibition of condiments and of fluids at high temperature (so frequently insisted upon in these pages), extends.

CONGENITAL AND HEREDITARY SYPHILITIC ULCERATION OF THE PHARYNX (Fig. 27, PLATE III.).

The **relative frequency** of hereditary lesions of the throat is as 5 per cent. of all forms of syphilitic manifestations in the throat, or 0.15 per cent. of all throat diseases, and as nearly 5 per cent. of all faucial and pharyngeal maladies. Congenital or hereditary syphilis may make itself evident in the pharynx at

the site of the patches in the pharynx, and the usual signs of pulmonary phthisis developed themselves. In one of my cases ulceration of the tongue, and in another, of the pharynx, existed two years and a half and three years respectively before any manifestation of pulmonary trouble could be recognised, though the ulceration was diagnosed and treated as tuberculous from the first. The later development of pulmonary symptoms testified to the correctness of the early diagnosis.

Cases have been reported of tuberculosis of the **pharyngeal tonsil,** and other portions of the naso-pharynx (see Chapter XVII.). I have not myself seen any manifestation in that region, but I have more than once had experience during the course of a pharyngo-laryngeal tuberculosis of a suppurative inflammation of the middle ear, which probably originated by extension of the disease along the Eustachian tube. The intense pain felt in the ear, as an almost constant sign of pharyngeal tuberculosis, but not specially characteristic of this disease, might well account for a non-recognition of such a condition prior to the occurrence of purulent discharge. It is possible that tuberculosis of the faucial tonsils is, as Strassmann (quoted by Schech) has observed, a common but unrecognised accompaniment of pulmonary tuberculosis. He believes that in such circumstances the symptoms are negative. The cases XIX. and XX., of Matilda H. and of J. J., which I have quoted, would support this view; but it is important to note that in neither of them was there any ulceration of the pillars of the fauces.

In the last few years it has been asserted by Lermoyez, Botey, and Dansac, that the bacillus of tubercle is to be found in a large proportion of removed tonsils, faucial and pharyngeal, and that active tuberculosis follows as a more or less direct sequence of the excision of these structures; but a very thorough examination of a large number of specimens in our own hospital has failed to confirm this observation, and I can recall but very few cases in which tubercle has developed in the later life of patients on whom I have performed tonsillotomy. On this point I am glad to have the support of so careful an observer as Jonathan Wright, who believes 'that tuberculous amygdalitis is a very rare affection, and that the tonsils are only rarely the seat of primary inoculation.'

The DIAGNOSIS need never be doubtful, if the practitioner is only alive to the possibility of its existence, since the only disease for which pharyngeal tuberculosis can be mistaken is syphilis in its advanced secondary or tertiary form.

When the acute attack is past, the prolonged exhibition of perchloride, biniodide, proto-iodide, or bicyanide of mercury, in small doses, is all-important as a tonic, and as a prophylactic against future relapses (Form. 91 and 103).

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to pass the instrument far beyond the commencement of the œsophagus proper. The œsophageal tube should be of small calibre. (3) Relief of the pain in swallowing is to a large extent involved in (4) The form of nutriment to be prescribed. All food should be soft and thickened, and, as a type, I may allude to the raw egg, either beaten up with milk or wine, or, preferably, simply thrown whole out of the shell into a glass. This, flavoured with a few drops of vinegar, should be swallowed at a gulp, and so taken it acts both as nutriment and as a soothing and protective application, nor does the vinegar cause pain. Oysters, thickened soups, cream, milk, will all suggest themselves as suitable in less extreme cases. As to the temperature of the food, cold fluids are better borne than hot, which always increase the pain. Sometimes ice is distinctly grateful and ease-giving. But a tepid degree of warmth is the most generally acceptable, and is the least likely *quà* temperature to either irritate or to cause muscular cramp.

Of more purely medical modes of relief, the application of a 5 or 10 per cent. solution of cocaine or eucaine shortly before food-taking has superseded all previous anodyne applications, such, for instance, as the morphinated glycerine of Isambert, which indeed, undiluted with water, is irritating rather than sedative. Nor have I found insufflation of either morphine or iodoform of service in pharyngeal ulceration. A preparation of benzoin, opium, and belladonna, mixed with yoke of egg (Form. 67), was of noted service in the first case for which it was specially prescribed, and this favourable experience has been many times repeated. It is often necessary to alternate these applications, when, as is not infrequently the case after long-continued use, one or other has lost its effect, and the list of variations may be further increased by employment of the mineral astringent solutions mentioned in the list of Formulæ, with the addition of cocaine, eucaine, or morphine. Externally, hot or cold applications by means of Leiter's coil are one or other agreeable, according to individual proclivities. Belladonna, menthol, and chloroform, separate or combined as liniments, and the application of chloral and camphor (Form. 53), are also amongst the external remedies worthy of trial. The sipping of barley-water or milk and water containing solution of morphine in very diluted proportions (not more than 1 per cent.) is of advantage in giving ease to both local pain and to distress of cough. The other sedative remedies named may be well employed in the form of lozenges, which should be of more than usually soft con-

A peculiarity in these ulcerations is their centrality of position, and, furthermore, their special tendency to attack the bone and to eventuate in caries and necrosis (Fig. CLVII.). The ravages of the disease present the typical appearances that are found in the tertiary syphilis of the adult. The œsophagus is but very rarely attacked. It is with hesitation that I venture to differ from John N. Mackenzie on a clinical point in connection with this subject, but I can hardly agree 'that the invasion of the larynx may be looked for with the same confidence in the congenital as in the acquired form of the disease.' It is quite true that laryngeal manifestations occur occasionally without evidence of pre-existing pharyngeal lesions, but my experience tends to the view that, as a rule, the ulceration of congenital syphilis is limited to the palato-pharyngeal and naso-pharyngeal tissues, and that laryngeal mischief is a comparatively rare sequel. Almost needless to say that this rarity is enhanced in proportion to the vigour and perseverance of treatment in the earlier stages of the disease.

FIG. CLVII.—ULCERATION OF VELUM IN CONGENITAL SYPHILIS (CASE XVI.).

A point of much clinical interest and importance, which has occupied the attention of Continental syphilographers, and has been elucidated in its special application to the throat by John N. Mackenzie, is the influence of some of the ordinary infectious diseases of childhood upon the progress of the inherited syphilitic affection. Sufficient evidence has been adduced to warrant us in saying (1) that while congenital syphilis affords no absolute protection against certain acute infectious diseases,—and an example has just been given in Case XVII.,—its existence in the individual seems often, other things being equal, to mitigate their severity and to exert a favourable influence on their course; and (2) that certain acute diseases, accompanied by an exanthem—as, for example, scarlatina and measles — favour the dissipation, at least temporarily, of the pharyngeal and other manifestations of syphilis. On the other hand, with regard to diphtheria, when this affection supervenes during the existence of syphilitic lesions in the throat, the patient is liable to rapidly succumb.

SYMPTOMS.—Beyond the character of the ulceration, there are

Lupus and Lepra of the Pharynx and Fauces.

Both of these diseases, when manifested in the throat, are so generally associated with extension to the larynx, that they will be described in detail amongst the diseases of that region.

Neuroses of the Pharynx and Fauces.

Nervous affections of the palate and pharynx are by no means rare, and occur as symptoms or as complications of a great variety of pharyngeal diseases. The neuroses may here, as in other regions, be conveniently divided into impairment of (1) the sensory, and (2) the motor functions.

Sensory.—**Anæsthesia** of the pharyngeal mucous membrane is said to occur in typhus and cholera, and is also common in general paralysis of the insane. From an investigation into the condition of the throat in fifty patients suffering from the last-named disease, made by me in 1875, at the invitation of Sir Crichton Browne, it appears that the reflex excitability of the pharynx is markedly diminished from the beginning of the disease, and prior to development of motor symptoms. Anæsthesia of the pharynx may also be present in connection with epilepsy and as the result of paralysis of the glosso-pharyngeal and pneumogastric nerves. In all these cases the origin of the neurosis is central. Of peripheral origin, the chief is the insensibility accompanying post-diphtherial paralysis, and on cicatrisation of syphilitic and other ulcerations. Lupous and leprous cicatrices are said to retain their sensibility, but exceptions to this circumstance are too frequent to warrant entire acceptance of the statement. Hysteria is another cause of pharyngeal anæsthesia, albeit it is also largely responsible for the opposite condition of hyperæsthesia. Finally, insensibility of the pharynx can be induced by the action of ice, or of extreme cold otherwise applied, and of certain drugs, as chloroform, bromides of potassium, sodium, or ammonium, morphine, and especially of cocaine and eucaine.

Hyperæsthesia can hardly be said to exist as a disease, but the presence of an elongated uvula, or other stimulus of irritation, may produce excessive sensitiveness of the part. In chronic pharyngitis there is, so long as congestion remains, a decided increase of sensitiveness, due to reflex irritation, and it is a common impediment to laryngoscopic examinations and intra-laryngeal operations.

Paræsthesia, or abnormal sensations in the pharynx and, it may be added, in the mouth, are very common. Disagreeing here with some other writers, they are always, in my opinion, symptomatic of some objective, but not always discovered, cause. The chief of such feelings are those of heat, pricking, swelling, weight, a straw, a hair, or other foreign body, and the rising of a lump in the throat (*globus hystericus*). One patient, an otherwise strong, hale farmer, complained of a feeling of intense cold, increased on swallowing and after food-taking. The characteristic cramp-like contractions, and attempts at swallowing even when not eating, constitute a veritable faucial and pharyngeal *tenesmus*, a term quite appropriate to the symptoms now under consideration, since, as will elsewhere be shown (Chapter XVI.), the sensations depend on almost exactly similar constitutional and local causes as those leading to rectal or vesical spasm and tenesmus.

As the result of examination of a large number of cases, made in 1878 in conjunction with my colleague, Dr. Dundas Grant, when he was Registrar of the Central Throat and Ear Hospital, I arrived at the conclusion that there are but very few cases of a purely hysterical character; and I read a paper on the subject at the International Laryngological Congress in Milan in 1880, and again before the Philadelphia Medical Society in 1887. The correctness of my views has since been confirmed by several independent and quasi-original communications. Further details on this subject are deferred to Chapter XVI.

Neuralgia, due to the same causes as those which produce similar disorders in other regions, may occur in the throat, and must be treated on general rather than on purely local indications. It is decidedly rare, but I have seen some cases of extreme and remittent pain analogous to neuralgia of the fifth or of the sciatic nerve, without any local sign of surface inflammation, and which by exclusion could be considered only as neuralgic; the diagnosis being subsequently confirmed by the effect of appropriate remedies. I cannot agree with Schech as to the uniformity or even common association of such symptoms with hysteria. (See 'Neuralgia of the Larynx.')

Female patients are much more liable than males to these nervous affections, and will in such case generally be found to suffer either from menorrhagia or amenorrhœa.

TREATMENT of all neuroses of the pharynx must be directed especially to the removal of the cause. In pharyngeal **anæsthesia** of extreme character, artificial feeding must be pursued so long as there is fear of food entering the air-passages; faradi-

sation, subcutaneous injection of strychnine, with the administration of iron and quinine, are the principal therapeutic agents. Friction and possibly modified massage may be of value.

In **hyperæsthesia,** when it interferes with laryngeal examinations, removal of the cause, as in the case of a relaxed uvula, and modulation of the sensibility in those cases due to pharyngitis, tuberculosis, etc., by anodyne applications, the chief of which, cocaine and menthol, are naturally at once suggested. Although trenching on the laryngeal portion of this treatise, it may here be conveniently remarked that the frequent touching of the intra-laryngeal parts with the probe, as recommended by many authorities, for the purpose of rendering them accustomed to instruments preliminary to operations—as for removal of growths —is a procedure neither practised nor advocated by me.

The treatment of **paræsthesia,** as has already been suggested, depends essentially on a proper diagnosis. With regard to **spasm,** the same may be said. In the case of varix—a cause to be later considered—the enlarged vessels are to be destroyed by the galvano-cautery, cocaine being first employed. Where a battery is not available, the acid nitrate of mercury is a most efficient caustic. It was held in great esteem by my friend the late Llewelyn Thomas.

When the teeth are at fault, it is most important to call in the aid of the dentist, not only for immediate relief, but because without doubt many cases of malignant ulceration commence with symptoms ascribed to purely functional causes. Faradisation, by means of the œsophageal electrode (simply an elongation of the laryngeal instrument), is of possible service in restoring healthy muscular action. In one case that came under my care on the recommendation of Mr. Poyntz Wright, of St. Neots, this treatment had been of no avail, but the patient recovered under the subcutaneous injection of ℥ij to ℥iv of the B. P. solution of hydrochlorate of strychnine.

MOTOR **paralysis of the pharynx** is usually of central origin, and may be due to injury to, or disease of, the brain and pneumogastric nerve. In its peripheral form it is a sequel of many wasting diseases, and especially of diphtheria. Paresis and paralysis of the velum is commonly associated with a chronic relaxation of the uvula, as well as of acute catarrhal inflammation of the fauces.

Spasm of the Pharynx may to some extent be considered as a motor neurosis, but is often merely a subjective symptom. It is met with, independently of paræsthesia, in an extreme degree

in œdematous and acute inflammations, and in hydrophobia. In its milder forms it may be due to incomplete mastication, arising from absence of teeth, or the imperfect 'bite' of an artificial set. It is to be distinguished from organic disease by the fact that the patient has difficulty, never actually amounting to inability, of deglutition, and quite irrespective of the consistence or temperature of the food. An important diagnostic sign of this form of dysphagia, and not, I believe, previously noted, is the condition of the muscles of mastication. If the surgeon places his fingers over the masseter and temporal regions, he will find that, on the patient making the movements of mastication, those muscles are more or less atrophied, the result of inaction. Not so in organic cases, where the teeth are perfect and mastication has been exercised even to excess. The œsophageal bougie or digital examination will complete the diagnosis. It is important to note that this form of spasm, innocent in itself, is, if neglected, liable to lead to true stricture of a practically, if not actually, malignant nature.

Spasm is also a symptom of chronic pharyngitis; and lastly, and above all, it occurs in the trouble known as *globus hystericus*, to which allusion has just been made.

TREATMENT in the peripheral class of cases comprises the exhibition of general tonic remedies, the application of local faradisation, hypodermic injections of strychnine, and the administration of thoroughly soft, peptonised, and, if necessary, artificially masticated food. A visit to the dentist is in appropriate cases the great essential.

The **prognosis** is favourable, except where the symptoms are due to central causes, when the outlook is, of course, quite the reverse. Such cases are, however, considered in systematic works on medicine, and do not here require further elaboration.

MALFORMATIONS AND DEFORMITIES.

Abnormalities of the pharynx may be conveniently divided into—

I. MALFORMATIONS OR DEFORMITIES PROPER.

II. GROWTHS.

I. MALFORMATIONS consist of—

(*a*) **Stenosis.** *Primary*, due to a congenitally unperforated state of the tube. *Secondary*, due to some inflammatory process, intrinsic or extrinsic, constitutional or traumatic.

(*b*) **Pouches.** 1. Congenital.
2. Pressure.

II. GROWTHS. Innocent or malignant, primary or secondary, which again may be either purely local in origin, or due to some constitutional dyscrasia.

(*a*) **Innocent growths.**

Lymphomata.
Fibromata.
Myxomata.
Lipomata. } *Mesoblastic.*

Angiomata.
Papillomata.
Adenomata. } *Epiblastic* or *hypoblastic.*

Teratomata.
Cystic. } *Mixed.*

(*b*) **Malignant growths.**

Sarcomata. { Mucoid. / Lymphoid. / Fibroid. } *Mesoblastic.*

Epitheliomata. { Alveolar. / Stratified. / Columnar. } *Epiblastic* or *hypoblastic.*

(*c*) **Growths** due to some **inflammatory** or **constitutional** cause.

Syphilis. { Mucous tubercles. / Condylomata. / Gummata. }
Tuberculosis.
Lupus.
Leprosy.

Congenital malformations assume the form either of stenosis, or of pouch-like dilatations. Their origin is to be ascribed to some departure from the normal course of development. A congenital stenosis when present may be found at the junction of the nasal pharynx with the oral, or, as is more usual, in the lower part of the pharynx, and in the majority of cases in neither situation is

there any practical inconvenience unless some inflammatory trouble occurs.

The malformation in the **lower** situation is indicated by an annular fold about one-twelfth of an inch in depth, and is situated at the junction of the pharynx and the œsophagus (Fig. CLXI.). In some cases there is, as a consequence, serious reduction of the calibre of the lower pharynx, and sometimes, though rarely, complete atresia exists. This last condition is always associated with sac-like protrusions of the pharyngeal wall.

FIG. CLXI. — CONGENITAL STENOSIS OF THE PHARYNX (MUSEUM SPECIMEN, R.C.S., No. 2295).

Congenital pouches are, however, found in association not only with atresia, but also when the upper part of the œsophagus is undeveloped. The figure on next page (CLXII.) also, from a specimen in the Museum of the Royal College of Surgeons, illustrates the conditions in the majority of the recorded cases.

In the **higher** situation, that is in the upper part of the oro-pharynx, the malformation, as in a case under my own observation, may take the form of a fleshy septum, appearing as a perforated diaphragm attached to the soft palate in front, and to the lateral and posterior laryngeal wall, thereby almost excluding the naso-pharynx. Another deformity is that in which the anterior pillar is separated from the posterior by a long narrow elliptical perforation. This may be either unilateral or bilateral. A sufficient number of both these eccentricities of development has been recorded to justify their interpretation as instances of congenital abnormality, the cause of which, as suggested by Solis Cohen, is a separate investment of the faucial pillars. Nevertheless the possible association of a syphilitic dyscrasia must not be ignored; and an illustration is afforded on Fig. 18, PLATE II., wherein the scars of old ulcerations on the left side effectually dispelled the probability of a congenital origin of a right-sided perforation, which otherwise offered no reason for suspicion. It has also been suggested that such perforations may be the residuum of a scarlatinal tonsillitis, or even of an ordinary quinsy.

Acquired deformities, like the congenital, may also be classed as stenoses and pouch-like protrusions. Stenosis of the

pharynx may be brought about by cicatrisation following syphilitic, lupous, or traumatic ulceration; or it may be due to pressure from abnormal conditions in neighbouring structures, as, for example, retro-pharyngeal abscess, spinal curvature, and glandular or other tumours.

Syphilitic stenosis in its most common variety is seen as the result of adhesions formed between the soft palate, posterior faucial pillar and posterior pharyngeal wall, a condition which shuts off more or less completely the naso-pharynx from the lower part of the cavity. The results of prior ulceration in the form of extensive destruction of the faucial pillars, uvula, or soft palate, which are usually present, make the recognition of the causal condition an easy task. Sometimes the hard palate is perforated, and this in my judgment excludes all doubt from the diagnosis. For, whilst lupous cicatrisation may simulate syphilitic — though there are not unimportant differences — perforation of the bony palate invariably means either that the ulceration is solely due to syphilis, or that a syphilitic factor is an element in the chain of causation.

Posterior. *Anterior.*

FIG. CLXII.—CONGENITAL ATRESIA AND POUCH OF THE PHARYNX (MUSEUM SPECIMEN, R.S.C., No. 394).

A less common variety of syphilitic stenosis exists in the form of the cicatricial membrane stretching laterally from the base of the tongue to the posterior pharyngeal wall, and perforated by a small opening, through which the epiglottis is sometimes to be seen. Still more rare is it to find, as the result of syphilis, stenosis of the laryngo-pharynx, where it becomes continuous with the œsophagus, a fact somewhat more remarkable when one remembers that stricture of the œsophagus itself from this cause is by no means infrequent.

Traumatic stenoses may follow the accidental or intentional swallowing of some corrosive poison such as the mineral acids; they are also met with in children as the result of drinking scalding water or other fluid. This form of stricture equally with that due to specific influence is apt to be very obstinate, and needs frequently repeated and prolonged use of the bougie.

Diminution of the calibre of the pharynx as a result of spinal curvature or of the pressure of pus tumours, etc., in the neighbourhood, must necessarily lead to dysphagia, and sometimes to dyspnœa, the diagnosis being made exact by thorough inspection and palpation of the region concerned. (See 'Retro-Pharyngeal Abscess,' p. 259.)

I have found but very scant mention of another cause leading to narrowing of the lower pharynx, namely, angular curvature of the cervical portion of the spinal column. Such a case occurred in my practice, and as it offers many points of diagnostic interest, may be briefly related:—

CASE XXII.—The patient, a gentleman, æt. 50, came under observation October 23rd, 1877. He complained of continual snuffling and accumulation of phlegm, of fœtid taste and odour, dropping into the throat from the post-nasal passages. Deglutition was difficult, except with soft food and fluids. Respiration was very short: the voice had become feeble, and was occasionally lost 'as if there were no breath,' but on the occasion of this visit was thick and toneless, and there was evidently an obstruction to free nasal respiration. The special sense of hearing, smell, and taste were unaffected. Examination of the anterior nostrils failed to reveal, as was suspected, any evidence of a nasal polypus. On attempting rhinoscopy and laryngoscopy, a large tumour was seen to project from the posterior pharyngeal wall. On digital examination, it was felt to be hard and circumscribed. It was as large, and extended about as far forward, as half a moderate-sized orange.

On externally examining the back of the head, it was at once seen that there was an angular curvature forwards of the cervical portion of the spine, the vertebræ implicated being the second, third, fourth, and fifth. The spine of the sixth could be distinctly felt. The patient explained that he had always had this curvature, but had suffered no inconvenience until after an attack of Indian fever some years previously, since which it had seemed to increase. Immediate temporary relief was given on elevation of the head, by placing one hand under the chin and the other under the occiput. Consultation was held with Mr. William Adams, who advised a support which should diminish the pressure; this instrument was accordingly adjusted, and exercised a good result. The explanation of the symptoms in this case is, without doubt, decrease of intervertebral substance, and possible absorption of the compressed vertebræ, caused partly by debility after the Indian fever, and partly by an excess of the natural tendency of the head to sink with advancing years. It is interesting to note further that the general health of this patient was exceedingly good, and that he was constantly and actively occupied, from philanthropic motives, in life-boat work on the southern coast. I had the opportunity of seeing him again in good health seventeen years later.

TREATMENT of acquired pharyngeal stenosis demands great perseverance, and is always liable to be unsatisfactory on account of strong disposition to relapse. Personally, I order a long

course of mercurial inunction prior to any attempt at splitting a stricture or dilating it by bougies: and I accompany these latter measures by the persistent administration of iodides. The galvano-caustic knife is to be preferred to the scalpel or bistoury; for actual incisions always involve the inconvenience of considerable hæmorrhage at the time, and on healing, a greater liability to an exaggeration of the original constriction. Pharyngeal stenosis, as a result of lupus, is rare, and is for the most part limited to the region of the fauces. The cicatrix has not so marked a tendency to shrink as the syphilitic scar, and is not accompanied by the curious outgrowths which often characterise and complicate the syphilitic lesion.

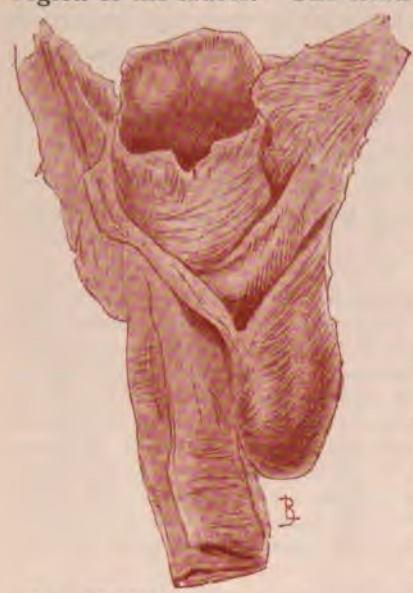


FIG. CLXIII. — PRESSURE POUCH OF PHARYNX (MUSEUM SPECIMEN, R.C.S., No. 2291).

The patient from whom this specimen was taken was a bishop, ninety years of age.

Dilatations and pouches of the pharynx apart from those due to errors in development usually occur in advanced life (Fig. CLXIII.), though there have recently been reported several cases at early middle age. It may be presumed that the protruded portion of the pharyngeal wall was originally weak, and has gradually yielded under the strain of deglutition. Hence they have been termed 'pressure pouches.' The particular point of weak resistance would appear to be at the junction of the middle and inferior constrictors, or at that of the latter with the œsophagus. There are rarely any troublesome symptoms, and even when swallowing is more or less interrupted, the patient has usually learned to empty the pouch by external digital pressure. Hence it is quite probable that they are more frequent than has been generally assumed. The mark of distinction, which is pathognomic, consists in the rejection after attempts at swallowing, and at intervals of a few minutes to even days, of undigested, although possibly decomposed, food.

Treatment until recently was barely palliative, and was only directed towards relief of the stricture; but Von Bergmann,

Billroth, Butlin, and others have successfully dissected out the sac by incision from without, and this promises to become classical as the only effective remedy.

Morbid Growths of the Pharynx.

Primary tumours are not common in the pharynx.

Of **benign** neoplasms the most frequent are the **lymphomata,** as might be expected from the abundance of lymphoid tissue in this region. One or more tumours—pedunculated or sessile—may be found growing from the pharyngeal wall. A most important element in the diagnosis is the enlargement of various groups of lymphatic glands with anæmic and possibly other changes in the blood.

Fibromata may be placed next in order of frequency. They are usually single, pedunculated, firm, and of slow growth. In some cases **myxomatous** changes occur in the tumour; in others the growth is closely allied to a **sarcoma,** and clinical considerations must be the guide to an exact diagnosis. The treatment, when the mass has a distinct pedicle, is removal by the galvanic eraseur; when the tumour is sessile, electrolysis is often successful.

Lipomata are uncommon tumours in the pharynx, but a few examples are reported. In one case, recorded by Barnard Holt, a pedunculated mass completely filled the pharynx, and extended downwards into the œsophagus.

The sessile form is readily mistaken for a post-pharyngeal abscess, the soft, elastic, 'doughy' sensation to the finger naturally suggesting the presence of pus. Diagnosis may be determined first by the history; and secondly, by the thermometer and the presence or absence of other symptoms of pus formation.

There can be no difficulty in dealing with a pharyngeal lipoma when it is pedunculated; in other cases, electrolysis is the best treatment, though enucleation by a lateral pharyngotomy is a feasible measure.

Angiomata.—These as considerable tumours are rare. In a few cases a mass of some size has been seen to project from the pharyngeal wall, its nature being indicated by the irregular surface and purple colour, and by the existence of tortuous varicose veins in the neighbourhood. In other cases, the tumour is manifestly composed of varicose veins—the plexus of Cruveilhier. It is right to include in this group the small 'red-currant like' granules often seen on the posterior wall of the oro-pharynx;

they are highly vascular, and are prone to bleed on simple touch. A favourite spot is the hyoid fossa, which is in fact a part of the pharyngeal rather than the laryngeal region. Such of the above conditions as require treatment are best attacked by electrolysis, or galvano-cautery. A few cases have been reported of visible arterial pulsation and tortuosity in one or other parts of the pharynx; the explanation of this circumstance is probably to be found in some abnormality of arterial distribution, especially of the vertebral and internal carotid, and it is of importance in regard to contemplated operations in the neighbourhood.

FIG. CLXIV.—LYMPHO-SARCOMA OF THE PHARYNX AND ŒSOPHAGUS (MUSEUM SPECIMEN, R.C.S., No. 2317).

Papillomata, except as irregular and ragged elevations, the result of syphilis, lupus, etc., are not common behind the isthmus of the fauces. When present they are easily recognised. No doubt histologically they are benign tumours, but suspicion is always attached to them in consequence of the difficulty in defining the boundary between innocence and malignancy in this situation, and the liability, as the result of friction, to the assumption of an undue activity. The *treatment* is to completely remove the growth right down to the base, and then to cauterise the site of its attachment.

Teratomata are relatively frequent in the pharynx. Their tendencies are benign, and their removal by snare or enucleation presents as a rule little or no difficulty.

Cysts of the pharynx are usually small, and result from obstruction to the mucous glands in the posterior and lateral walls. Incision, and the use of the curette, generally suffice for their cure. *Submucous cysts* have also been described, and these, from their deeper situation, are less conspicuous. They have been credited

with the production, by reflex irritation, of asthma, migraine, and other neuroses.

Malignant growths in the oro-pharynx will be considered in relation to those of the fauces and tonsils. Cancer in the naso-pharynx is rarely primary, while, as to the laryngo-pharynx, since the new growth most frequently involves the larynx also, the further consideration of malignancy in this region will be more appropriate to the section on Laryngeal Diseases. One figure (CLXIV.) only is appended as an illustration of a lympho-sarcoma, which appears to have been primarily pharyngeal, with extension only in the direction of the œsophagus.

CHAPTER XIV

DISEASES OF THE UVULA AND SOFT PALATE

(*Open out* PLATES II., IV., *and* V. *at end of the Book, during perusal of this Chapter*)

IN considering diseases of the alimentary pharynx, it has been deemed expedient to include in some measure affections of the faucial arch.

But although, when inflammation or ulceration attacks the upper part of the pharynx or fauces, the uvula and soft palate are almost always involved, it is convenient on clinical grounds to deal with these structures separately; and especially since it cannot be denied that disease in this situation may arise independently.

Hospital statistics give a **relative frequency** of diseases of the uvula as 5 per cent. of all throat diseases, and as nearly 7 per cent. of all affections of the fauces and pharynx. With the remark that almost all non-specific inflammations of the soft palate are accentuated in the uvula, it is unnecessary to further justify their association.

ACUTE INFLAMMATION OF THE UVULA—ŒDEMA OF THE UVULA (Figs. 28 and 33, PLATE IV.).

This is rarely seen except as associated with general pharyngitis; but now and again cases come under observation in which the uvula suddenly becomes red, swollen, and infiltrated, with comparatively little hyperæmia of the neighbouring parts. The condition has been accorded a **relative frequency** of 3 per cent. to all affections of the uvula.

This acute inflammation of the uvula partakes of the nature of tonsillitis, and occurs in people of an arthritic diathesis; the bowels are constipated, and the digestive system deranged. Œdema of the uvula is also not uncommonly seen in tertiary syphilis, in phthisis, and in cases of general hydræmia. Hæmor-

rhagic extravasation is also occasionally witnessed (Figs. 31 and 32, PLATE IV.). It is generally of traumatic origin.

The SYMPTOMS complained of are those of obstruction to the respiration, a sense of discomfort in taking food, and a frequent desire to swallow saliva, with but little acute pain.

Cough, when present, is of an irritating, tickling character, and is induced in those cases in which the uvula touches the epiglottis. It is, however, often absent in acute œdema when the enlargement is more that of bulk than of length.

TREATMENT.—Removal of the uvula is not advisable during acute inflammation, and it is preferable to make a few punctures and scarifications, followed by the use of astringent remedies. In syphilic œdema the uvula should on no account be ablated.

SUBACUTE AND CHRONIC INFLAMMATION OF THE UVULA (Fig. 14, PLATE II.).

This is seldom seen unassociated with a certain amount of chronic pharyngitis, which is more often limited to the pillars of the fauces, without any extension to the velum. Chronic inflammation leads to the next affection:

ELONGATED UVULA—CHRONIC RELAXED THROAT (Fig. 14, PLATE II.; Figs. 29 and 35, PLATE IV.).

Relative frequency.—Relaxation requiring treatment, on account of the symptoms thereby occasioned, is found to constitute 90 per cent. of the diseases of the uvula. The condition is met with in all classes of patients suffering from chronic angina, but especially in those who have been obliged to use the voice during catarrhal attacks—just, in fact, in those who have been described as most subject to chronic pharyngitis. Very few people suffering from that disease have not a relaxed uvula; but this last-named condition often gives rise to symptoms which demand treatment quite irrespective of the rest of the pharynx.

Morbid anatomy.—Apart from specific causes, the uvula may be permanently enlarged, either as a congenital abnormality, or as a result of some chronic intrinsic changes, which may thus be classified according to the prevailing histological features:

1. Fibroid.
2. Œdematous or mucoid.
3. Vascular.
4. Glandular.

Excluding constitutional causes, such as renal, hepatic, and other obstructive diseases, the purely local morbid influences giving rise to elongated uvula are to a great extent speculative. Still there can be no hesitation in accepting transient attacks of inflammation as having a direct or indirect causal relation.

Muscular atrophy undoubtedly plays an important rôle, both directly and indirectly, in not a few instances, for it is by no means a rare experience to find the muscle fibres showing well-marked degeneration, often cloudy in character, similar to Zenker's changes.

This, occurring at all ages, cannot be interpreted as a simple senile change; it is doubtless the result of some form of paralysis, central or peripheral, such as follows diphtheria, typhoid, or influenza, in which circumstances the muscular elements undergo rapid wasting.

When no vestiges of muscular fibres are seen at all, even in sections close to the soft palate, it is reasonable to assume that they are either congenitally deficient, or that the cause of their disappearance occurred at a very early age. This absence of contractile power must be a strong predisponent.

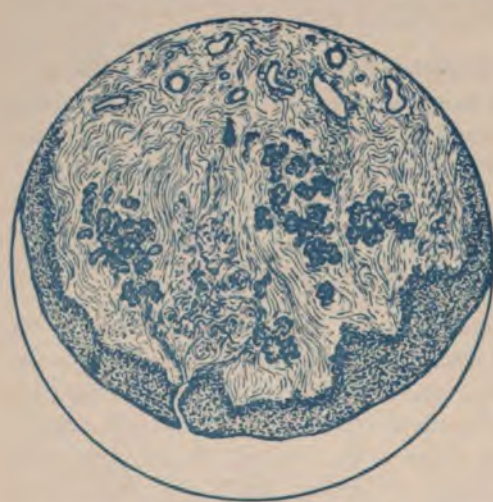


FIG. CLXV.—SECTION OF REMOVED PORTION OF RELAXED UVULA (1 *in. Obj.*).

The usual histological features are shown in Fig. CLXV., which, being one of many similar sections, may be considered illustrative of an ordinary case of elongated uvula.

The veins are considerably distended, and their walls are thinner than usual, whilst the arteries are proportionately smaller. The connective tissue is loose and œdematous, probably due in part to distension of the lymph and connective tissue spaces, and excess of mucoid matrix. Under a higher power the surface epithelium is seen to be thickened, owing to increase in number and vacuolation of the cells. The glands in this section do not appear to be hypertrophied, but in some instances they constitute the bulk of the organ, whilst, occasionally, groups of lymphocytes

beneath the epithelium and between the glands, indicate slow inflammatory changes. Thus fibroid and œdematous tissue chiefly prevail, whilst a vascular hypertrophy, consisting of dilated tortuous veins, may often be sufficiently marked to justify the use of the term *varix*.

In all the many sections made of uvulæ, removed on account of elongation, muscle fibres were invariably few in number, indicating at once the expediency of the operation, and the soundness of the operator's judgment; for if the organ contained muscular tissue, its removal would presumably be unnecessary or excessive in extent.

The loose arrangement of the connective tissue, with the preponderance of matrix in advanced examples, are features strongly suggestive of an ordinary mucoid polypus, a simile perhaps justified by a consideration of the surroundings; for each is a localised pendulous mass of œdematous tissue occurring in a moist region, a condition favouring vascular distension and mucoid degeneration.

The swollen or œdematous condition is also due to the hygroscopic nature of the mucin which occurs in such abundance both in the uvula and in the nasal polypus.

SYMPTOMS: A. **Functional.**—These vary greatly in different cases, and often require the nicest judgment for their discrimination.

Thus, while one patient with an evidently very pendulous uvula will not complain of any inconvenience, another with apparently but slight local cause will exhibit well-marked symptoms. The usual sensation is that of a desire to frequently clear the throat of a source of irritation; this desire being only experienced at particular periods—as, for instance, on rising in the morning, on coming into a warm out of a cold atmosphere, and also when the general system is fatigued or disturbed. In more severe cases, there will, under similar circumstances, be hacking, irritable cough, with expectoration of small muco-gelatinous pellets, paroxysmal and spasmodic attacks, retching and vomiting. I have seen several cases in which the last-named symptom occurred on the patient taking the ordinary morning cold bath, and in one instance the breakfast had been daily rejected for many weeks. In more than one case, gargling after cleansing of the teeth has been followed by violent spasm, with bloody expectoration, clearly traced to come from the pharynx.

When the uvula is very relaxed, the greatest discomfort is felt as the patient lies down at night; many cases occur of spasm of the glottis—due to reflex irritation from this cause—so severe as to awake patients from sleep.

It is but natural that symptoms such as those described combine to bring the patient to a state of great nervous prostration; the want of sleep, the cough, and the retching will produce great weakness and even emaciation, and the patient will appear to be suffering from phthisis or other grave organic disease; especially will this be suspected in those occasional cases in which there is an account given of fixed pain at some point in the chest, which on examination is found to be only another effect of reflex irritation.

CASE XXIII.—I was consulted in the year 1873 by a medical practitioner, who complained of constant pain on the left sub-scapular region, with irritable cough, loss of flesh, and impairment of general health; on the recommendation of two physicians, eminent in chest diseases, he sold his practice, but he entirely recovered his health after the removal of his uvula. He is still well, and but recently retired from active professional work on account of advanced age.

CASE XXIV.—Again, Mr. Low, of Burton-on-Trent, in the year 1888, brought me a gentleman of middle age, to whom a most alarming opinion had been given; and letters were laid before me detailing the presence of tubercle bacillus in his sputa, and forming a most gloomy prognosis. Mr. Low had all along attributed his symptoms to reflex irritation of an elongated uvula and its consequences. In this opinion I concurred, and after simple surgical treatment the patient made a complete recovery. He is still alive.

Gastric derangements will be aggravated by the presence of an elongated uvula, while, on the other hand, the symptoms caused by the relaxed palate will be increased by anything likely to induce or increase disorder of digestion.

The ill effects of a relaxed uvula on the voice, especially if exercised in singing, are very marked. Fatigue and pain after functional use, loss of strength, purity and brilliancy in quality, of steadiness (causing *tremolo*), and even of range, are the precursors of hoarseness and entire destruction of the singing voice. To the occurrence of such serious conditions as a direct result of relaxed uvula, both Mandl and Labus have testified. The latter very properly points out that disorder of phonation from this cause is due not so much to elongation of the uvula, as to the difficulty which, on account of its relaxed condition, the subject experiences in making the various movements of the soft palate which are necessary for the formation of different sounds, or to paresis of the elevators and tensors.

B. **Physical.**—These are not easily mistaken, if the surgeon will bear in mind the following suggestions when he makes an examination of a relaxed throat:

1. Direct the patient to open the mouth without taking a breath, and the relaxed uvula, which, if in a normal condition, should on inspiration be retracted, will be seen to be lying on the tongue.

2. Should the palate not drop by the patient thus holding the

breath, direct him to breathe *out* through the nostrils, which will have the result of relaxing the palate, and the length of the uvula can be estimated.

3. Let the patient then breathe in deeply through the mouth or strike a high note, and it will be seen that the uvula is not entirely drawn up, owing to paresis of the tensor palati, or that the uvula goes up in wrinkles, partly from the same cause and partly from the excess of relaxed tissue.

4. Remember that the amount of relaxation depends on the relation which the length of the uvula bears to the arch of the palate.

5. In those cases in which, observing all these precautions, the uvula does not appear to be relaxed, and yet there is no other reasonable cause for the symptoms, observe carefully the edges of the curtain of the soft palate, and they will be seen to be thinned, white, and quite translucent, and to almost flap about with respiratory action.

This last appearance will be often present in ordinary cases of otherwise recognisable relaxation of the uvula, so that it is quite possible to mark the boundary of membranous over-growth (Fig. 29, PLATE IV.). There is often hypertrophy of the lymphoid glands or follicles in the tissue of the uvula, giving the appearance of little tubercles, fatty deposits, or, in the case of the acino-tubular glands, cysts (Fig. 35, PLATE IV.). Their presence is of no real importance, except where pain is experienced. These little bodies may then be real tuberculous deposits, and the commencement of a phthisical ulceration. Under certain circumstances they may indicate an early stage of lupus.

The larynx is generally slightly congested; this is due to the constant irritation of the cough. Mucus may often be seen lying in the inter-arytenoid fold. The veins at the base of the tongue are often concurrently relaxed, engorged and varicose, and the lingual tonsil hypertrophied.

TREATMENT.—The cause having been ascertained, it must be removed, at the same time that steps are taken to brace up the relaxed mucous membrane. Astringent lozenges and applications may be employed (Form 12, 14, 15, 16, and 19; 56, 59, and 65). These failing, there can be no reason why the simple operation of ablation of the relaxed portion should not be performed; on general grounds, however, astringents should always be first used, since it is advisable to see how much of the relaxation is temporary and how much permanent. In mild cases, particularly when associated with dyspepsia, attention to the general health will often obviate altogether necessity for abscission.

In operating, the uvula should always be well drawn out with the long forceps, and removed just above the point of junction of the relaxed membrane with the body of the uvula (Fig. CLXVI.). Instruments on the guillotine principle, called uvulatomes, are not suitable for the purpose of ablation of the uvula. The tendency to retraction of the velum when touched renders it very uncertain how much will be removed by such means. The parts are always bruised and crushed, but as there is no point of resistance to the instrument, the tissue is often only partially separated. An American physician informed me that 'he was bound to say that he had never used an uvulatome without being obliged to finish

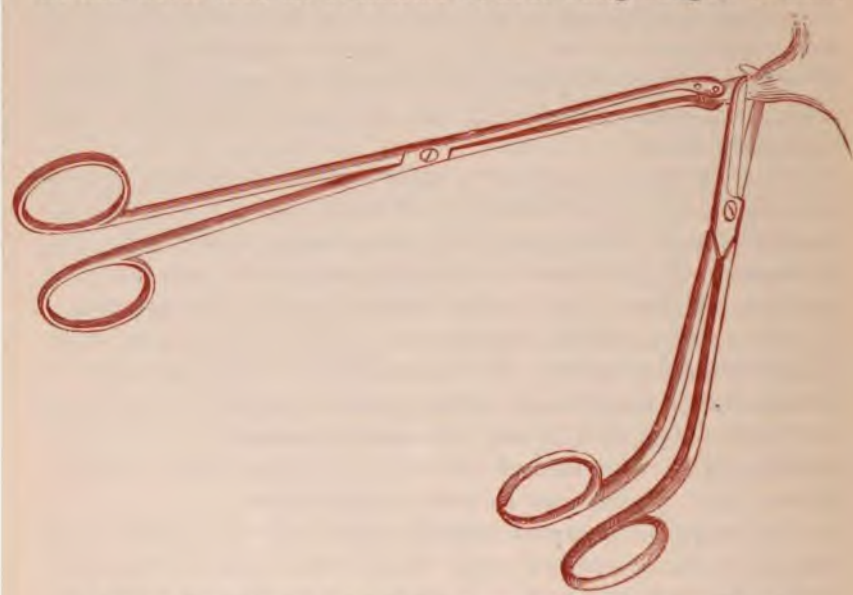


FIG. CLXVI.—UVULA FORCEPS AND UVULA SCISSORS, IN POSITION FOR OPERATING.

the operation with scissors'; and such, I believe, will be the general experience of all who employ this instrument. Nor is it advisable to make, for many days previously to removal, lines around the uvula with caustic pastes. No real death of the part takes place, but there is a considerable increase of inflammation around, so that, when division is made, both the operation and the healing process are more painful and recovery more tedious. There is also a greater risk of secondary hæmorrhage. In cases where the uvula is very thin, and also where the patient has an objection 'to the knife' or to loss of blood, I am now in the habit of removing the elongated portion by means of the galvano-

cautery used at a good bright heat, the tissue being first drawn out by the forceps as has been advised prior to division by scissors. In all circumstances I previously apply cocaine in a 5 or 10 per cent. solution, as the pain of this quite minor procedure is always apprehended by the patient, and is really considerable in some cases. Where there is varix of the vessels at the base of the tongue, I destroy them with the cautery point at the same time as, or rather prior to, removal of the uvula.

While it is better to take off too much than too little, cases have certainly occurred in which too complete removal of the uvula has been followed by long persistent pain and some difficulty in swallowing. Inasmuch as there already exists an unreasonable amount of prejudice against the surgical measures here advocated, it is a pity that anything should be done to bring disrepute upon so valuable an operation, of which it has been truly written that, 'while hardly any slight affection of the throat produces such serious symptoms as elongation of the uvula, it is equally true that there is no slight operation that gives such complete and permanent relief as removal of the elongated extremity.'

Regarding treatment by operation, Mandl has also well said that 'it is unfortunate that this operation should encounter very ill-founded opposition on the part of singers, since there can be no doubt of its happy effect on the voice due to the removal of a permanent cause of irritation in those cases in which it is indicated.'

If the patient be directed, after the operation, to sit perfectly still without washing the mouth, hæmorrhage but seldom happens —never when the cautery is employed, unless the platinum be of more than red heat; should bleeding occur, the sipping of a few drachms of a saturated solution of tannin (Form. 4) will speedily check it. Should it recur, application of the fluid known as styptic colloid—a combination of collodion, alcohol, and tannin —will have the desired effect of forming a more firm coagulum. The pain of the operation itself is generally but slight, though sometimes intense; the amount of after-pain is likewise very variable; more or less discomfort in swallowing is experienced for from twenty-four hours to a week, and all food should therefore be soft and tepid. With sensitive patients I recommend application of a 5 per cent. solution of cocaine to the cut surface prior to taking food. Where there is pain in the ears, drops of laudanum, atropine, or cocaine applied on wool along the external auditory meatus are serviceable. Care must be taken to avoid catching cold; the patient should stay within doors for a day or two, and the voice should be completely rested. One other caution is

necessary with reference to the after-treatment of these affections, namely that, as in all other cases of reflex irritation, while in the majority relief is immediate, in others, some time may elapse after the cause has been removed, before all the symptoms disappear. Remembrance of this fact will often anticipate disappointment and prevent discouragement.

Malformations.

The uvula may be asymmetrically truncated, bifurcated, or even absent, as the result of an arrested development. The most common form is the bifurcated. This abnormality admits of easy morphological interpretation. The hard palate, and doubtless a large portion of the soft palate with the palato-pharyngeal arch, is

Fig. CLXVII. — Congenitally Double Uvula with Relaxation.

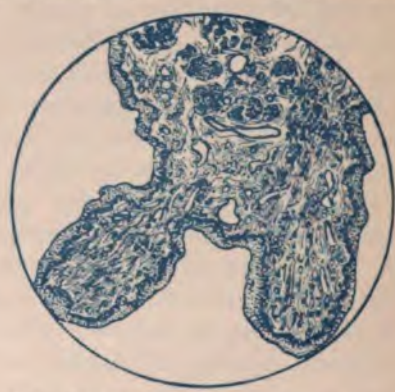


Fig. CLXVIII. — Section of removed Bifid Uvula, showing absence of Muscle Fibre (1 *in. Obj.*).

developed from the palatine outgrowth of the maxillary processes and palato-pharyngeal muscle; whilst the anterior pillars, including the uvula, are developed from the second visceral arches. Thus the uvula is originally bilateral, interference with the union of the two halves is responsible for its bifurcation, and this exaggerated, constitutes cleft palate. This condition in the uvula exists in various degrees, from a simple cleft involving a short portion of the tip only, to complete separation, extending as far as the soft palate, as shown in the accompanying drawing (Fig. CLXVII.) of a congenitally double uvula, occurring in a young man, æt. 22, and giving rise to considerable symptoms of discomfort. The hard palate was very contracted and highly arched, and this is almost always the case, but no difficulty is usually

experienced in either articulation or deglutition. Removal is followed by relief of all disagreeable symptoms.

Fig. CLXVIII. strikingly illustrates not only the polypoid arrangement already described as characteristic of simple elongations, but it further emphasises the absence of all muscular elements in the diseased portion. It is interesting to add that I have once or twice seen a triple uvula, namely, a central and efficient one, with on each side a shorter prolongation, neither of which contain muscular fibre.

Of other malformations of the soft palate, irrespective of clefts, may be mentioned those **perforations** which, in the absence of any suspicion of congenital syphilis, can be fairly interpreted as of developmental origin. They have been already mentioned at p. 305. Such abnormalities may be unilateral or symmetrical. They may occur in the *lateral* portion of the soft palate alone; when *central* they are undoubtedly syphilitic. More usually the perforations involve the faucial pillars, both anterior and posterior, the former being the most frequent. Absence of evidence of sclerotic changes, or of cicatrisation, negatives an inflammatory origin.

New Growths.

Fibromata are by no means uncommon. I have myself seen four, and have reported three examples, all in my private practice; and have seen others in hospital under the care of one or other of my colleagues. They almost always originate in the fibrous aponeurosis of the soft palate at its junction with the periosteum of the horizontal plate. Although attaining considerable size, they are of relatively slow growth, and remain submucous unless interfered with, when they are apt to fungate and to suggest the appearance of a veritable sarcoma. They also give but little inconvenience, though in one of my cases, probably as the result of mechanical impediment to the venous flow, rather free hæmorrhage occurred at intervals. When distinctly circumscribed and encapsuled, the best treatment is enucleation, a comparatively easy operation. In other circumstances electrolysis is most successful.

Adenomata are also found in the palate, but admit of no special remark, since their identification is only possible after removal, which constitutes the appropriate treatment. In all these tumours the knife is preferable to the cautery.

Papillomata, not necessarily dependent on any syphilitic history, though often found in patients having that dyscrasia, are

found growing from some portion of the surface of the uvula so frequently as in 1½ per cent. of the disorders of this structure. These benign neoplasms do not as a rule give rise to much inconvenience; but in several instances which have come under my notice the growths have been attached by a very long pedicle, and have produced violent irritation of the larynx and spasmodic cough.

In one such case (XXV.), which I reported to the Medical Society of London, so far down did the growth hang (Fig. 30, PLATE IV.), that it was not seen until a laryngeal mirror, introduced to examine the glottis, pushed it up into view. In this instance removal was followed by immediate relief of distressing and even urgent respiratory symptoms, with constant spasmodic cough; and such is the treatment to be generally recommended.

Cysts of the soft palate and uvula (Fig. 35, PLATE IV.) are of the retention variety, due to obstruction in the gland ducts so numerous in this region. Like gummata, these *mucoceles* often commence in the posterior aspect of the soft palate, and may escape notice in their early history.

Angiomatous (vascular) growths (Figs. 39 and 40, PLATE V.) have also been reported as arising from this situation, and cases have come under my notice, both in my own practice and that of my colleagues. They have been successfully treated by galvano-cautery. The following example of a primary angioma is probably unique. It occurred in the clinique of Dr. Orwin.

CASE XXVI.—L. M., æt. 12, applied at the Central Throat Hospital on account of obstruction to nasal breathing, and of other subjective symptoms, which appeared to be sufficiently accounted for by the condition depicted in the drawing. The vascular neoplasms involved not only the uvula but the soft palate along its centre line, as far as its attachment to the hard. A peculiarity of this case was that, while the uvula projected forwards in a state of repose, it could be turned up on forcible expiration, so that its dorsal aspect became ventral.

I have seen but one case of **malignant** disease arising primarily in the uvula, but it is not uncommon to witness it in that situation as an extension from epithelioma of the tonsil. The exception referred to was as follows:—

CASE XXVII.—Mr. G. H. A., æt. 48, a sugar planter residing in Barbadoes, consulted me on June 15, 1897, by the recommendation of Dr. Watson of Tunbridge Wells. He stated that he had enjoyed excellent health in the West Indies, having had no illness except an attack of dysentery and occasional eczema. He had been married twenty-four years, and was the father of one child, a healthy girl, now thirteen years of age. He applied for advice on account of pain and difficulty in swallowing. He had recently become much thinner. The patient had been a great smoker and a 'moderate drinker' of rum and other spirits. His family history was bad; for his father had died at sixty-three from exhaustion, after amputation at the knee for sarcoma; while his mother, although still living at seventy-four, had undergone two operations for malignant disease of the breast, the first in 1887, the second in 1895. On examining his mouth, the uvula was seen to be a warty thickened mass, with all the characteristics of

an epithelioma (Fig. 37, PLATE V.). The disease had invaded the palate, but so far the tonsils had escaped. There were no enlarged glands to be felt. On 19th June the whole of the growth, with a wide margin of the soft palate, was removed by the scissors, Mr. Bland Sutton kindly assisting, and Dr. Holloway administering the anæsthetic. There was but little bleeding, and the patient made an excellent recovery, with rapid regain of lost weight. In *March* 1898 I heard from Dr. Watson that the patient had written recently, saying that 'he is keeping quite well.'

FIG. CLXIX.—PRIMARY EPITHELIOMA (SQUAMOUS) OF UVULA ($\frac{1}{2}$ *in. Obj.*).

Mr. Wingrave's report on this interesting case was as follows:—

The specimen, labelled 'Mr. A.,' consists of typical stratified epithelial growths with small cell tissue. Horny 'pearls are very numerous, and there can be no doubt whatever as to its malignant nature.' Fig. CLXIX., a drawing of the microscopic section, shows a localised activity of the surface epithelium which is invading the subjacent tissue in the form of cylinders, attended by inflammatory cell tissue, these cylinders in section appearing as true epithelial nests. The rest of the section was healthy.

And it appears appropriate to record in this place the following example of an epithelioma of the curtain of the soft palate, since it did not in the least involve the tonsil (Fig. CLXX. and Fig. 38, PLATE V.).

FIG. CLXX.—PRIMARY EPITHELIOMA OF SOFT PALATE.

CASE XXVIII.—The drawing was made from a patient whom I only saw once, in February 1879. He was a man of 52 years of age, who had always enjoyed good health until within the last three or four months, since which time he had experienced pain in swallowing. He had not become thinner. Both nares and larynx were slightly congested, which might be accounted for by the statement of the patient that he had always been a great snuff-taker. On examining the mouth, the whole of the

soft palate was seen to be unduly hyperæmic, capillaries coursing over its surface as shown in the illustrations. There was a small warty growth just at the free border of the left anterior faucial arch, and slightly hanging over the supra-tonsillar fossa of that side. It was of such a character that I had no difficulty in diagnosing it as an epithelioma. The patient allowed me to remove a fragment for microscopical examination, which entirely confirmed my belief in the malignancy of the growth; but I could not induce him to have the whole removed, nor was I able to ascertain any details of the further progress of the case. It should be mentioned that there were no enlarged glands, but there was distinct tenderness on external pressure under the left angle of the lower jaw.

TREATMENT of all new growths of the uvula consists in surgical removal, and since this procedure involves no vital risk, it should be adopted at the earliest possible moment after recognition. Experience derived from the few cases of carcinoma which I have been able to record, supports the general opinion that in such circumstances, a more favourable prognosis may be given than is possible in malignancy of other regions of the throat.

NEUROSES OF THE SOFT PALATE.

As a complement to what has been written of the neuroses of the pharynx and fauces, a few words may be added regarding one which more particularly affects the soft palate, albeit it is often relegated to treatises of otology, under the head of objective noises. I refer to **choreic spasm** of the levator and tensor palati. Cases are not rare. The main **symptom** is a clicking sound, audible to the observer, even at some distance from the subject. This, on investigation, is found to be produced by an approximation and separation of the tongue and palate.

This condition is presented in two forms: the *voluntary* or *mimetic*, and the *involuntary* or truly *choreic*—the distinction between the two being that in the former the spasms are remittent, while those of the latter are rhythmical and almost constant; the movement also, which is in abeyance in the voluntary form when the mouth is opened, is continuous in this circumstance when the spasm is involuntary.

CHAPTER XV

DISEASES OF THE FAUCIAL TONSILS

(*Open out* PLATES II., IV., *and* V. *at end of the Book, during perusal of this Chapter*)

THE regional and microscopic anatomy of the (normal) faucial tonsil has already been described with detail in Chapter II., and should be carefully studied in order to fully appreciate the changes the gland may undergo in disease.

ACUTE TONSILLITIS, AMYGDALITIS, ANGINA TONSILLARIS, ACUTE INFLAMMATION OF THE TONSILS, QUINSY.

Hospital statistics of relative frequency.—No less than 12,330 cases of diseases of the tonsils were recorded at my hospital in ten years. This number represents about 13 per cent. of all the cases treated of throat, nose, ear, and neck; something under 30 per cent. of all throat diseases, and 66 per cent. of all faucial and pharyngeal disorders.

Of this total of 12,330 diseases of the tonsils, 3167 cases are recorded of acute or subacute inflammation, otherwise rather more than one-fourth of the whole were due to this cause.

The mucous covering of the tonsils may share in any of the inflammatory changes which attack the pharynx and fauces, but, as usually understood, the term 'quinsy' implies acute inflammation limited to, or at least originating in, the gland itself.

Several distinctions have been made in this affection, but for practical purposes they are mainly differences in degree; thus only the mucous surface and the orifices of the crypts or lacunæ may be inflamed (*superficial tonsillar angina*), or only a few crypts may be attacked by inflammation, and their function arrested without involving the gland (*lacunar tonsillitis*, the so-called *follicular catarrh of the tonsils*); or the whole gland structure of the tonsils may be involved, *parenchymatous tonsillitis*). This stage

when proceeding to suppuration, is in turn called *tonsillar abscess*; and by some authors the term 'quinsy' is, without philological reason, reserved for this suppurative stage. While on this question of nomenclature, I may express gratification that the erroneous term, *follicular tonsillitis*, sometimes called still more ignorantly 'ulcerated sore throat,' is gradually being abolished, for these distinctive prefixes have been applied to a condition in which the lymphoid follicles are by no means necessarily involved, and in which there is no ulceration whatever. The term *lacunar* was adopted by me twenty years ago, as accurately representing the anatomical relation of the morbid condition. It was later pointed out to me that it had been previously proposed by Wagner.

The researches of B. Fränkel and Sokolowski indicate that there are two distinct forms of lacunar inflammation, one characterised by lacunar distension and blocking with epithelial cells, cocci, and leucocytes; the other by true fibrinous exudation—in other words, that this form of inflammation is, according to Fränkel, *desquamative*; while Sokolowski maintains that it is *exudative*. I believe that both forms may exist, but my personal experience points to the former as the most common.

Beyond these we owe to Moure renewed insistance on the recognition of an *acute lacunar tonsillitis*, which is truly ulcerative or necrotic. This, however, is somewhat uncommon, and of quite a different character from that form, to the nomenclature of which exception has been taken.

Peri-tonsillitis is written of by some authors as if it were quite common to find a primary cellulitis of the tissue bounding the tonsil, but in my experience this is rare, and in any case it is very seldom when the process extends to suppuration that the tonsil itself escapes. Much more frequently the condition is secondary to an inflammation of the parenchyma, either coexisting or consecutive; and at least, occasionally, it may be represented as a burrowing into the supra-tonsillar fossa.

Incomplete figures — the differentiation not having been made for the full period—would appear to subdivide my hospital cases of acute and subacute tonsillitis into 55 per cent. as the proportion in which the inflammation commenced in the *lacunæ*, 28 per cent in the *parenchyma*, and in 13 per cent. in which the *peri-tonsillar* tissue was involved.

ETIOLOGY: **Bacteriological.**—In consequence of the prominence now-a-days accorded to bacteriology, particularly as applied to these diseases, it is incumbent on us to seriously consider the necessity for a new classification of tonsillitis. At the outset, we

must, I apprehend, agree to abolish classification on a purely clinical basis, although it is interesting, at the dividing of the roads, to allude to the fact that Moritz Schmidt, of Frankfort, a prominent laryngologist in the fatherland of bacteriology, in his book published so recently as 1894, not only perpetuates the *Angina follicularis* of Morell Mackenzie and older writers, which he appears to consider non-infectious, but he also distinguishes an *Angina lacunaris*, which in his opinion is a typical infectious inflammation of the tonsil. Gouguenheim's nomenclature of *Crypto-follicular inflammation* indicates a similar indisposition to give full adherence to the new views.

Sokolowski and Dmochowski have worked with praiseworthy industry to harmonise the *bacteriological* with the *histological* evidence, and to classify tonsillar inflammations on these lines. But the terminology which is the outcome of their labours is not only inconclusive, on account of the limited experience on which it is based, but is also far too involved for practical application.

Nor have attempts to classify the different forms of tonsillitis on a *purely bacteriological* basis been more successful, and for the following among other reasons:—

1. Park's investigations of healthy throats, both in adults and children, in the country as well as in towns, have demonstrated that streptococcus is found in the mouth and upper air passages at all periods of life, after the second day of birth; and that this organism, as well as a staphylococcus, morphologically identical with such as is found in healthy throats—but in increased number—is likewise often found in children suffering from pneumonia or phthisis.

2. It is comparatively seldom that only one kind of organism is present in any inflammatory disease of the tonsils; nor is this to be wondered at, when we consider the enormous number—something like a hundred—of micro-organisms, pathogenic and non-pathogenic, to be found in the mouth and nasal vestibule of perfectly healthy people.

An instance of the liability to this mixed infection, even in specific inflammations, is to be found in cases of diphtheria, in which a pure cultivation of the Klebs-Löffler bacillus is present in a proportion of only about 7 to 10 per cent.

For the following two exceptional cases of mono-microbic throats, I am indebted to my colleague, Mr. St. George Reid, in charge of the Bacteriological Department of the Central London Throat, Nose, and Ear Hospital.

The first (Case XXIX.) was that of a boy, æt. 17, who was taken suddenly ill with rigors, etc. The temperature in five hours reached 106° F., but the only local complaint was

tenderness in swallowing. This was followed by swelling of the tonsils, and general inflammation of the fauces, with enlargement of the glands at the angle of the jaw. A serum culture showed pure *Diplococcus pneumoniæ*; the boy was well in five days.

CASE XXX.—Allied to this may be noted another case of a sharp attack of faucitis, following an operation on the uvula, in a man aged forty-seven. The culture showed pure *Micrococcus tetragonus*.

But supposing that we were to classify these tonsillar inflammations as pneumo-coccal, strepto-coccal, staphylo-coccal, diplo-coccal, etc., according to the preponderance of any particular micro-organism, as was first advocated by Boulloche in 1893, and adopted a year later by Norris Wolfenden, we should not have exhausted the subject. For, according to Bareggi, such inflammations may be caused by the influenza bacillus of Pfeiffer. Or again, according to Kreibohm, we must recognise a septic sore throat characterised by the presence of *Bacillus crassus sputigenus*, cultures of which produce a virulent poison.

And yet again, in exceptional cases of tonsillar inflammation, Koch's bacillus of tubercle, and even the "ray-fungus," the organism of actinomycosis, are reported to have been detected. The former is reported to have been frequently noted in hypertrophy of the pharyngeal tonsil by Lermoyez and Dieulafoy, and many other continental workers, but repeated examinations of adenoids removed at our hospital have failed to find them, and the association is probably rare. There is evidence to show that in certain forms of tonsillitis, such as that of scarlet fever, a particular micro-organism—the streptococcus—is seen to be specially grouped as to indicate, according to Kurth, a high degree of virulence, and is invariably present (often pure and always predominant) in such cases. But the important link in Koch's postulates of specificity—namely, that of reproduction in animals—has up to now not demonstrated the streptococcus to be the specific organism of scarlet fever. We cannot, therefore, at present diagnose the infectiousness of a case of tonsillitis by bacteriological evidence alone, with any greater certainty than we can solely by its clinical characteristics. Why one case of lacunar inflammation should be membranous, and another not so, without, in either instance, the presence of the diphtheria bacillus being demonstrated, and even with complete similarity of micro-organism, is at present unexplained. Probably a solution of the problem might be found by accepting the varieties as representative of different degrees of intensity. This point was touched on in Chapter XI.

Boulloche considers that when staphylococci predominate the disease is more localised, and of a milder character; in the case

of a streptococcus predominating, it has a tendency to spread; and in the case of other inflammations, for instance pleurisy, associated with this organism, the prognosis is more grave. My own experience is in accordance with these conclusions, and also that it is in this last-named form of inflammation that we find sympathetic or infectious associations such as ovaritis (Bergen, 1757; Verneuil, 1857, and Joal, 1886), orchitis, appendicitis, of which I have seen examples, and arthritic inflammations, to be more fully alluded to later. In point of fact, the infection is systemic in character, and is marked by a degree of pyrexia and prostration out of all proportion to the local affection.

Evidence to hand demonstrates the existence of a purely pneumo-coccal throat; a tonsillar inflammation of plastic character, associated solely with the presence of the Fränkel-Talamon organism, of which one case has already been here recorded; while similar examples have also been reported by Gabbi, Jaccoud, Féréol, and Rendu, the last recording the case of a nurse who slept in the wards of a children's hospital among patients suffering from pneumonia, and contracted an erythematous angina, for which this organism, being the only one detected, appeared to be solely responsible. Rendu, in conjunction with Boulloche, has also found this organism alone, in cases of angina complicated with influenza.

Extension to the lungs, to the pleura, to the meninges, and to the joints, may be produced by this same form of pneumococcus, Picqué, Veillou, Weichelsbaum, Monti, Ortmann, and Sammler having each recorded cases; whilst Gabbi has demonstrated the connection experimentally, both by injecting cultures of the cocci into the joints, and also into other parts of the body subcutaneously. There can be no reasonable doubt, therefore, of the existence of a pneumo-coccal throat, which is not only insidious in its onset, but is also under certain circumstances highly infectious. My own experience, however, points to the fact that a diplococcus—of probably a less virulent type—is responsible for some of the mild cases. The following is an example:—

CASE XXXI.—A female, æt. 15 years, who had suffered from sore throat three days previously, was admitted to hospital on November 5th, 1894. The tonsils were enormously inflamed and enlarged; the crypts blocked with thick yellow caseous secretion, some confluent, and with a certain amount of opalescent surface cloudiness in the interspaces. A culture was made, and the bacteriological report stated that no growth was visible to the naked eye, but microscopic examination showed the presence of a few cocci arranged as streptococci, mostly of the short and rigid variety, the preponderance of the organisms being diplococci. The tonsil suppurated, and was incised. The throat remained 'dirty' and was long in clearing up, but recovery was complete.

I have also seen the diplococcus associated with varieties of hypho-mycetes in the throat of a subject suffering from extreme constitutional debility and chronic alcoholism. A case is recorded in my book, *Diphtheria and its Associates*, p. 132.

CASE XXXII.—A male, æt. 52, was taken ill with pain in the back and limbs, and sore throat, on November 1st, 1894. He was *admitted* on November 3rd. There was an erythematous rash on the legs and feet. Patches of greyish exudation were seen on the fauces, uvula, right side of the soft palate, and on the left tonsil. Beyond this the throat generally exhibited several mottled patches of an almost purple colour, not unlike the skin eruption, on an unduly anæmic foundation, Fig 64, PLATE VII. With the *laryngoscope* the epiglottis was seen to be inflamed and much thickened, while there was a thick patch of pale yellow secretion on its under surface, blocking up the vestibule, and hiding the vocal cords.

The case was sent to the hospital as one of diphtheria, but our diagnosis was surrounded with doubt; the balance of opinion was at first in favour of its being syphilitic, notwithstanding that the history rather negatived such a conclusion, and that there were no scars on the penis or in the groin. The man, however, was a chronic alcoholic, had suffered from empyema of the left pleura, and was the subject of disease of liver, kidney, and heart. He died within forty-eight hours of admission, the patch in the right tonsil having, in the meantime, developed into an ulcer. Autopsy confirmed disease in all the organs named.

A culture was taken on November 4th, and the report of the *bacteriological examination* demonstrated the presence of 'cocci in pairs, small bacilli in chains, larger than *Bacillus diphtheriæ*; large thick bacilli in chains, and fragments of a large fungus.'

Consideration of the foregoing statements forces us to a conclusion that, whilst a classification on bacteriological grounds, however plausible it may appear at first sight, is—to say the least of it—difficult. It must also be necessarily incomplete in its clinical application. For example, Bernabei examined twenty cases of primary acute tonsillitis, with the result of finding streptococci in all. But it was impossible to obtain a clinical picture of any similitude, some being erythematous, some lacunar, some pseudo-membranous, and others even phlegmonous.

From my own experience, the presence of streptococci in a case of suppurative tonsillitis would prevent me from formulating any dogmatic conclusion as to a causal relation between the organism and the disease. For, while in the majority of the cases of suppurative tonsillitis streptococci are found in preponderance, in all instances in which the inflammation has extended to the middle ear, leading to perforation of the drum-head, not the streptococcus but the staphylococcus is found in the aural discharges. Of this fact I am assured, but I have no explanation to offer; for, excluding the possibility of the streptococcus becoming a staphylococcus, there is no evidence to show that the one has a greater or less vitality than the other. It is possible, however, that the tympanic cavity may

be a more favourable medium for the growth of the staphylococcus.

We may be somewhat helped on our way towards an agreement of bacteriological with clinical evidence, by a study of the following table, compiled from one hundred cases observed and classified by Mr. St. George Reid, at the Central London Throat, Nose, and Ear Hospital.

TABLE OF MICRO-ORGANISMS FOUND IN 100 CASES OF TONSILLITIS.

Streptococcus	*longus*	16	cases
	brevis vel rigidus	42	,,
		—	58 ,,
Staphylococcus	*Aureus*	31	,,
	Albus	23	,,
	Citreus	7	,,
	Cereus albus	1	,,
		—	62 ,,
Klebs-Löffler bacillus			7 ,,
Streptococcus articulorum vel flexuosus			2 ,,
Diplococcus			32 ,,
Micro-coccus tetragonus			14 ,,
Bacterium termo of Vignal			18 ,,
Bacterium fragilis of Vignal			2 ,,
Micro-coccus albus liquefaciens			13 ,,

This table is given for what it is worth, and it may be accepted as in general agreement with others as to the preponderance of the streptococcus and staphylococcus in tonsillar inflammations, as well as illustrating a greater frequency of the presence of the Klebs-Löffler bacillus than was until recently suspected in throats not clinically typical of diphtheria. But it does not coincide with any degree of closeness with other similar tables, nor is it reasonable to expect it; for there are many conflicting elements of date and circumstances which cannot but involve a variety of results. For instance, it is impossible to take any one culture as a fair index of the prevailing bacteria in a disease of constantly progressive change which extends over several days; and this difficulty will always meet us in any attempts to arrive at a definite bacteriological diagnosis of acute non-specific inflammations of the throat.

In only seven of the cases in our table did the cultures appear to be mono-coccal, three of these representing *Staphylococcus citreus*, and one Klebs-Löffler bacillus. As regards the organisms present in relation to clinical facts, the milder subacute cases principally showed *Staphylococcus pyogenes albus*, mixed with *Streptococcus brevis* in the more acute. In the still more severe cases, *Staphylococcus pyogenes aureus* took the place of *Staphylococcus*

albus, the streptococcus still showing the same relation to the severity of the symptoms. The presence of *Streptococcus brevis* was very marked in cases of moist inflamed throats with developing tonsillar or peritonsillar abscess, but in cases where there were ragged openings to the abcess, with considerable suppurating surfaces exposed to the air, the *Streptococcus pyogenes longus* was nearly always present. It will be noted that these observations agree very closely with the conclusions of Boulloche.

The following is a representative case from my private notebook :—

CASE XXXIII.—A lady, æt. 35, went to church on January 26th, 1896, and occupied a seat near the door. The following morning she was conscious of having taken cold, and on the Tuesday the left tonsil became much swollen and inflamed, and the temperature rose to 103° F. The next day, January 29th, the right tonsil was also attacked, the left one being still the more swollen, while each was extremely red with yellow ulcerated-looking patches on its surface. During the night the swelling in the left tonsil burst, and a quantity of pus was evacuated. After this the inflammation rapidly subsided on both sides, no suppuration occurring in the right tonsil.

A cultivation was made, and microscopical examination detected the presence of *Streptococcus longus* and *Streptococcus articulorum*.

Consideration of the foregoing synopsis — imperfect and condensed as it is—of our present knowledge, and of the table with the conclusions to be deduced therefrom, makes it clear that a satisfactory classification of tonsillar inflammations must be much more comprehensive than any of those hitherto attempted, and that the evidence of the culture tube can be only of value when taken with repeated confirmation and in conjunction with that afforded by bedside observation.

This is not the place to consider, at the length which the question merits, a classification of tonsillitis in relation to its infectiousness, independently of such as is truly diphtherial. Perusal of the reports of our own Local Government Board, and of similar literature from continental centres, leave us, however, in no doubt that every now and then epidemic waves of tonsillitis are to be found spreading over considerable districts—and these not always as an increased activity of an endemic state. More limited are those occurrences of sore throat which attack, either by infection or contagion, members of a household, or occupants of a particular ward, or it may be of a whole hospital.

But in considering the question, by analogy with other diseases of acknowledged specificity and infectiousness, there is much more to be said against the infectious character of a non-diphtherial tonsillitis than in favour of it. For the case of infection we have only a certain degree of parallelism in the clinical history, and a

possible epidemicity, but both these points are contradicted and their importance minimised—

First, By the circumstance that in almost all—if not all—of the patients who are attacked, there exists a strong predisposing factor in the shape of tonsillar hypertrophy—faucial, pharyngeal, and even lingual.

Secondly, That the epidemic is very apt to be regulated by certain meteorological variations.

Thirdly, So far from one attack conferring immunity against a second, as is more or less the case in all infectious fevers—influenza perhaps excepted—each invasion of tonsillitis leaves the subject more liable to another. And this tendency to recurrence may often be altogether overcome, and immunity secured, by removal of the tonsillar structures implicated.

Fourthly, From the clinical point of view, it is at present impossible to agree with Schmidt that any one of the many varieties of non-specific tonsillitis is more responsible than another for the infection, for in every epidemic all forms of inflammation are represented.

And, lastly, it cannot be claimed that any additional support can be given to the theory of suggested infection by applying a bacteriological test, for we are at present quite unable to satisfy ourselves of a specific organism of simple infectious sore throat, which is necessarily the first step towards the establishment of identity.

Only by a systematic bacteriological examination of all cases, and in all phases of a reputed epidemic, can we hope to attain any substantial data for deciding this important point.

Predisposing Causes.—Among the most common predisposing causes assigned by various writers has been a strumous constitution, rendering the patient liable to inflammatory attacks, similar to those so frequently seen in the lymphatic glands. This view has, however, always required the qualifying admission that, in tonsillitis, exposure to cold is an exciting cause, whereas this circumstance plays no important part in the production of ordinary strumous glandular disease, except perhaps that it opens the door to the first infection. It is also open to argument that the glands may be infected from the tonsils.

From most careful examinations, extending over a number of years, I have long been of the opinion that the darthous or arthritic diathesis invariably exists in those patients subject to recurrent attacks of acute tonsillitis. There need not necessarily be, though there very often is, corroborative evidence, either in the family or personal history of the patient; but it is certain

that attacks of quinsy are most prevalent at those periods of the year and under those atmospheric conditions which are most favourable to rheumatic exacerbations, namely, in early spring and the later months of autumn, when cold damp weather with south-east winds is prevalent.

Apart from meteorological influences, in those exhibiting recurrence, we find a marked tendency to periodicity.

Even in my first edition, so closely did I associate the relationship between tonsillitis and rheumatism, that, in order to complete the picture of the etiology of the former affection, I printed verbatim the concise account of the predisposing and exciting causes of acute rheumatism, given by F. T. Roberts in his *Practice of Medicine*, merely changing the name of the disease:—

'**Predisposing Causes.**—Tonsillitis is distinctly an hereditary disease, and it tends to run in families. It chiefly attacks persons from fifteen to thirty-five years old, being especially frequent from sixteen to twenty, but no age is exempt.'

It is comparatively rare to see acute tonsillitis in very young children, though I have seen a typical case of quinsy in a girl only ten years of age; and John Reid has recorded a case of suppurative tonsillitis in an infant aged seven months. It is most common between the ages of fifteen to thirty; after thirty-five it is rarely seen, though cases have been reported up to sixty, and one, by Whistler, at a still more advanced period of life, namely, sixty-five. I remember also that the father of a patient informed me that he had an attack of suppurative tonsillitis when seventy-one. He died in his eighty-second year. Continuing to quote Roberts:

'Previous attacks decidedly increase the predisposition to the disease. More cases are met with among males, and in the lower classes, on account of their greater exposure to the exciting causes. Climate and season have a considerable influence, the affection occurring mainly in temperate but very moist climates, and where there are sudden changes of temperature. It is far less common in tropical and very cold countries. The same conditions influence the prevalence of the complaint at different seasons. A state of ill-health from any cause is said to predispose to tonsillitis, and also mental depression or anxiety; but many individuals are attacked when in apparently perfect health.'

'**Exciting Causes.**—The ordinary exciting cause is a sudden chill, induced by exposure to cold and wet; sitting in a draught when heated or perspiring; neglecting to change wet clothes, or in other ways. In not a few instances no definite cause can be fixed upon; and it is quite conceivable that processes may be gradually carried on in the system which tend to generate an amount of poison sufficient to set up the complaint. Errors of diet, suppression of menses, and various other disturbances, have been ranked as causes.' It is not at all uncommon to see amenorrhœa lead in the same patient at one time to rheumatism, and at another to tonsillitis. 'Scarlatina seems to lead to tonsillitis sometimes, probably by interfering with the excretory function of the skin (and gland).'

When, in 1878, I first insisted on the rheumatic diathesis, as the principal etiological factor of quinsy, it was received in some

quarters with ridicule, and by many as an exaggeration, but later the same idea has been enunciated as quite an original view by more than one writer.

It was not until the occasion of the annual meeting of the British Medical Association at Leeds in August 1889, that Dr. Archibald Garrod, opening a discussion on the relation between tonsillitis and rheumatism, accorded me credit for strongly insisting on the close connection between the two diseases. Both Dr. Garrod and I had independently investigated the history of this view, and, while he mentioned Stoll in 1777 as the first author to speak of 'rheumatic angina,' I was able to trace its history back to Musgrave 1710, Sauvage 1771, and to discover an allusion to it by John Ball in 1762. And thus I had simply been instrumental in reviving a theory which was proved to be by no means new.

Haig Brown, 1886, apparently ignorant of what I had written, correctly said that 'one may do more than merely suggest a comparison, and say that the tonsillar inflammation is sometimes truly rheumatic; or, in other words, that in many instances the cause which *predisposes* to the development of tonsillitis is the rheumatic habit, while the cause which *excites* the inflammation is cold and damp, just as these are the usual determining factors in articular rheumatism.' He gives statistical evidence of the most convincing character as to the association of rheumatism and tonsillitis, mentioning especially the occasional manifestations of a cardiac complication during an attack of quinsy.

However, since this discussion in 1889, I have found reason to somewhat modify my views as to the rheumatic connection of tonsillitis, and although still believing that tonsillitis is sometimes rheumatic, and perhaps more often gouty, I am prepared to adopt the opinion of the late Sir Andrew Clark, as expressed in a private letter addressed to me in July 1889.

He wrote: 'If one will think merely of the rapidity with which the tonsil manufactures and discharges lymph cells, it will not be difficult to see how a sudden suppression of this process, the accumulation of effete matters in the crypts, and the filling up the lymph spaces with products of bacteria life, and with matters undergoing evolution, may contaminate the blood, and originate the troubles considered as rheumatic.'

I was at once ready to accept this interpretation, which was at that time decidedly an advanced view. Since that date this contamination of the system, or blood poisoning, has been acknowledged to be of microbic origin by several observers, notably Buschke, who recognises the tonsils as the entrance door for purulent micro-organisms; and Kraske, who alludes to acute osteomyelitis as being due to organisms which found their first entrance to the system through the tonsils.

The researches of Roos, Boeck, Stabell, and Otto Seifert seem to prove that, after infection by the tonsils, the micro-organisms

may migrate to the joints, synovial cavities, and endocardium, as in gonorrhœa. It is also noticed that many such cases of articular rheumatism do not yield to salicylates—a fact supporting the view that these affections are quite as often due to pyæmic metastasis as to a rheumatic dyscrasia.

Other etiological factors of tonsillitis doubtless exist, and most of these are septic. First in importance is the drinking of impure water or milk diluted with impure water, and the inhalation of sewage gas; such causes will act more powerfully in those patients who are the subjects of the rheumatic disposition; in other words, those whose resisting powers are habitually reduced. Caution must be exercised in accepting insanitary forms of tonsillitis as non-infectious, and especially if several members of a household are attacked.

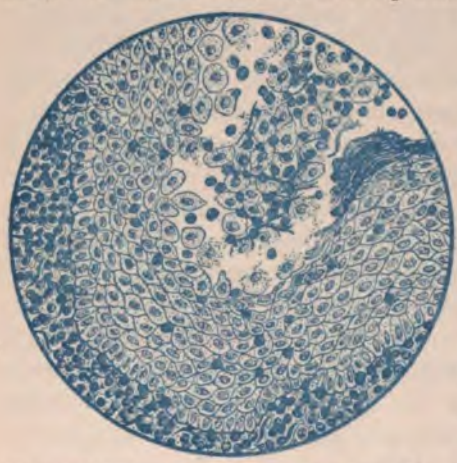


FIG. CLXXI.—ACUTE DESQUAMATIVE TONSILLITIS (⅛ *in. Obj.*).

It remains only to add that acute inflammation of the tonsils may indifferently attack a gland, the subject of chronic enlargement, or one which is of normal size or even atrophied. All tonsillar inflammations may be unilateral or bilateral, and not unfrequently, disease having been arrested, or having subsided on the one side, is developed on the opposite. In all cases the inflammation is liable to extend to the lymphatics of the pillars of the fauces, and of the soft palate.

ACUTE DESQUAMATIVE TONSILLITIS (LACUNAR TONSILLITIS).

MORBID ANATOMY.—The tissue changes in acute tonsillitis may be conveniently considered under two groups—namely (*a*) **acute lacunar** or **desquamative,** and (*b*) **acute parenchymatous** or **suppurative.**

(*a*) **Lacunar.**—In this variety the histological changes seem to be mainly confined to the crypts, whilst the lymphoid tissues only indicate very slight activity.

The epithelial cells lining the crypts become swollen, vacuolated, undergo rapid multiplication, and die, thus producing white

patches, which, if scraped off, are found to consist almost entirely of epithelial squames, with very few leucocytes and no fibrillar network.

The creamy discharge from the lacuna is not true pus, but a mixture of epithelial cells, lymphocytes, and bacteria.

There is general enlargement of the organ, chiefly due to vascular distension; this subsides with the diminution of the constitutional symptoms, and long before disappearance of the lacunar changes.

Considerable difference of opinion has been expressed as to the histological details of acute lacunar tonsillitis; Sokolowski maintaining that the lacunæ are filled with coagulated fibrin, holding lymph cells and bacteria in its meshes. He describes small cocci, diplococci, streptococci, and bacilli. The adenoid tissue he found to be normal, except for increased infiltration. All these changes he interprets as indicating a mild diphtherial process. Such conditions doubtless do occur occasionally, but they certainly do not constitute the only features of lacunar tonsillitis. Coagulated fibrin may easily be mistaken for extreme distension of the fine lymphoid reticulum, or it may be due to slight interstitial exudation.

Fränkel maintains that the lacunar discharge contains no fibrin, but chiefly leucocytes and epithelial cells and cocci.

Acute lacunar tonsillitis may vary considerably in degree, from a simple lacunar epithelial proliferation with vascular engorgement, to active, plastic, and purulent distension of the crypts. The disease is essentially a local leucocytosis, which the epithelial and lymphoid tissues share to a greater or less degree; it is also associated with several bacterial forms, none of which has been proved to be specific.

(*b*) **Parenchymatous.**—The microscopic changes are chiefly characterised by an excessive leucocytosis, commencing in the lymph nodules and extending to the surrounding lymph pulp, until their differentiation is lost. The capillaries, at the same time, are greatly distended with blood, so that the whole organ is increased in size from both causes. As a result of these rapid inflammatory changes, the cells die, and pus is produced, which may collect either in the substance or in the loose cellular bed on which the tonsil rests **(peritonsillitis).**

In some instances the suppurative changes seem to primarily attack the cellular tissue of the tonsil, whilst the cortical or lymphoid part is involved in a minor degree. At all events, in whichever tissue the inflammatory changes may commence, the

intensity of the process is directed mainly to the areolar tissue of the 'core.'

SYMPTOMS: A. **Functional.—Voice.**—The phonetic quality of the voice is not affected, except in so far as general prostration may diminish its power.

Articulation and enunciation are greatly impeded, and are quite characteristic in the obvious pain accompanying the acts, and in the complete unintelligibility of the speech; articulation is affected by the inflammatory swelling of the gland and of the pillars of the fauces; difficulty of enunciation depends largely on impaired mobility of the jaw.

Respiration.—The free passage of the air to the lungs is impeded, and **nasal breathing** is almost entirely obstructed, the patient snoring loudly even when awake.

Circulatory System.—It is always well to examine the heart, as, far more often than is generally recognised, a bruit is heard, which admits of various interpretations. Thus it may be due—(1) To endo-cardial changes; (2) to lowering of cardiac tone and consequent dilatation; and (3) to changes in the physical characters of the blood itself, giving rise to the so-called hæmic bruit. All or any of these may be the result of toxic influence, which obviously includes the rheumatic. In recent years I have often been impressed with the presence of pronounced heart murmurs in cases of apparently simple subacute tonsillar inflammation; and I find Stabell reporting a case of 'follicular tonsillitis,' accompanied by acute rheumatism, which was followed by cardiac distension and valvular insufficiency. In the acute form of necrotic tonsillitis, endocardial changes of a grave character are the rule rather than the exception.

Cough.—None; but a frequent desire is felt to clear the mouth and back of the pharynx of the peculiar and abundant viscid mucous secretion.

Deglutition is greatly impeded by narrowing of the faucial orifice and by muscular spasm: it is accompanied by pain of a lancinating character, extending to the temporo-maxillary articulation. It is this pain which prevents the patient opening the mouth, and causes even the swallowing of saliva to be distressing. There is often complete inability to swallow any food, even of the softest consistence, blandest character, and mildest temperature; and attempts at drinking frequently result in ejection of the fluid through the nostrils, some of it also oozing with saliva and mucus from the angles of the mouth.

Hearing is often temporarily impaired, with not infrequent

pain, due to extension of the inflammation to the middle ear. The gravity of the aural inflammation varies, and is seldom severe; but cases of exudation, serous and purulent, into the tympanic cavity, are by no means unknown. In many instances, severe tinnitus—usually of the pulsating variety—is complained of.

The senses of Smell and Taste are both greatly affected; the latter being much impaired by the constant presence of foul secretion in the mouth.

Pain in connection with functional exercise has been already alluded to; but it is a constant, ever-present symptom of the disease, and the one element which appears more than another to produce the very characteristic prostration. At the commencement of an attack there is simply a feeling of dryness and heat; but as the affection advances the swelling of the parts and of the surrounding glands, as well as cramp of the muscles, and the ineffectual attempts to perform functional acts, and to be rid of oppressive obstruction, all tend to produce a sense of well-nigh intolerable suffocation. Pain is complained of, not only in the throat and, as before mentioned, in the ears, but in the temporo-maxillary articulation, and in rotation of the head, which is often held quite stiff, as in retro-pharyngeal abscess. Headache is also a constant and wearying symptom. Painful sensations are always increased on awakening from sleep.

B. **Physical.**—The practised observer will, if the disease be at all advanced, have probably arrived at a correct diagnosis on hearing and seeing the patient's attempts to describe his symptoms; but any doubt will be at once removed when he endeavours to examine the throat, the difficulty of opening the mouth being almost pathognomonic of suppuration of the parenchyma of the gland. Should he succeed in gaining a view of the fauces, he will see, behind an overloaded foul tongue, a more or less uniformly red and swollen mucous membrane. The affected tonsil or tonsils (most frequently only one is attacked at first; or one is in a much more advanced stage of inflammation than the other) will be seen heightened in colour, and enlarged in size, causing great narrowing, or complete closure, of the faucial orifice. Sometimes the crypts will be observed to be blocked by arrested excretion, or covered by a foul, creamy exudation. The uvula, which may partake of the inflammation, and be œdematous, will more often, in non-septic cases, be seen relaxed, and lying adherent, as it were, to one or other tonsil. The pillars of the fauces are not always inflamed, but the

anterior ones are more often involved than the posterior. The inflammation rarely extends to the pharynx, and still more seldom to the buccal cavity, or mouth. In patients predisposed to quinsy, and whose tonsils have been removed, subsequent recurrence may attack the fauces. It is, however, but rarely that the process in such a case goes the whole length of suppuration.

When visual inspection is impossible, it may be desirable to examine with the finger, so as to ascertain whether suppuration has taken place; but such a procedure should be adopted with hesitation, as it always occasions increase of the pain.

C. **Miscellaneous.**—In these, as in the causes, there will be noticed a great analogy to rheumatism. The general system is greatly disturbed, the patient being really ill. Frequently the disease commences quite suddenly, but more often there is a warning of a day or two. In hospital practice patients seldom apply until they have been ill three or four days, 'thinking the attack would pass off.'

At the commencement, the ordinary febrile symptoms of inflammation are present, viz. heat of skin, nausea, thirst, etc., with nocturnal exacerbation; frequently there is the warning of a rigor; this stage is soon succeeded by profuse, cold, sour perspiration, with pallor of surface, anxious expression of countenance, and mental depression, greatly increased by want of sleep, and occasionally resulting in delirious wandering. The tongue is coated, the breath foul; appetite is lost, and thirst is constant. The temperature is greatly increased, averaging 103° F., but sometimes rising to 104° and 105°, the pulse being correspondingly accelerated.

Obstinate constipation almost invariably precedes and accompanies the disease; the urine is high-coloured, loaded with excess of urea and urates, and deficient in chlorides; occasionally there is presence of albumen. Haig Brown has noted 'that the existence of albumen in the urine seems to be in direct ratio to the height of the temperature. When this is over 103°, a trace of albumen is often present; but there are no casts, and the albumen always disappears when the temperature begins to fall. Its presence is of no more importance than is the transient albuminuria of pneumonia and erysipelas, though, on first finding it, one is apt to feel a little uncertainty as to whether the throat affection is not of a diphtherial nature. Yet it is important to note the time of its appearance—if it do appear—and of its disappearance, and for these reasons: if albumen be found for the first time on the second or third day, the temperature being at 103° F., or more,

and disappears on the fourth, we are almost surely dealing with a case of simple tonsillitis; if, however, we find albumen in the early days, with a comparatively low temperature (100° or 101°), and especially if the albumen persist for two or three weeks, the case is most likely one of diphtheria; while, if there have been no albumen early, and it be found for the first time after the end of two, three, or more weeks, it is most probable that the case has been one of latent scarlatina.'

Bouchard and de Kannemberg have also written on the complications of tonsillitis with nephritis and albuminuria.

Externally, except where there is suspicion of diphtherial or scarlatinal origin, there is seldom sufficient glandular enlargement to account for the pains and stiffness in the lower jaw, but there is sometimes, in severe cases, painful puffiness of the tissues of the face and neck, indicating a cellutitis or peri-adenitis. Very frequently there are associated rheumatic articular and muscular pains in the limbs; and in many cases in which the disease does not reach suppuration, resolution of the local trouble is followed by a smart attack of rheumatism, or rheumatic gout.

DIFFERENTIAL DIAGNOSIS.—The diseases that may be confounded with tonsillitis are diphtheria, phlegmonous pharyngitis, scarlatina—where the rash is ill-developed—syphilis, cancer, post-diphtherial and labio-glosso-laryngeal paralysis.

From *diphtheria* it may be differentiated by variation in many of the subjective and general symptoms, into which it is needless here to enter. Especial points of distinction are the ease with which the fauces can be examined in diphtheria, and the fact that the secretion in tonsillitis is copious and ropy; in diphtheria it is scanty: when membrane is present in tonsillitis, it is non-adherent, and does not lay bare a bleeding or ulcerated surface when removed: whereas it is most rare, when diphtheria attacks the pharynx, not to see patches, which are firmly adherent, on the uvula and soft palate. Cases are now and again seen in which diphtheria follows on an attack of tonsillitis; in such an event the inflammation is exhibited, as is the diphtheria itself, on both tonsils equally. A bilateral tonsillar inflammation of the *lacunar* variety not unfrequently occurs to some members of a household, generally the elder relatives or immediate attendants, in which diphtheria has arisen. Such an attack may not go to the length of suppuration, but will have many modified points of resemblance to the more serious malady, and will exhibit several of its complications and sequelæ. These septic varieties of tonsillitis, which are often highly infectious, may arise independently of

co-existent evidence of diphtheria epidemics; and they have been thought to be forms of sore throat intermediary between those of diphtheria and scarlatina, the exudation of the one and the exanthem of the other not being manifested, but the neurosal and renal complications being both often exhibited. The diagnostic facts just quoted regarding the presence of albumen in the urine, and the different signs of scarlatina, to be presently mentioned, are of value in deciding the innocent or septic character of the attack.

In the sore throat of *scarlatina* the local differences are not so well marked, but both tonsils are always attacked simultaneously. The hot, dry skin, high degree of pyrexia, flushed face, and characteristic enlargement of the papillæ of the tongue, even without the appearance of the rash, will assist in marking the distinction. It must not be forgotten that in some rare instances of tonsillitis there is a slight skin eruption.

Legendre reports a case of purpura, and nodo-papular erythematous rash, occurring during the course of an acute tonsillitis:—

A patient—a female, æt. 33—three days after the first symptoms were observed in the throat, developed a purpuric rash on the abdomen and inner side of the legs, which lasted on and off for fourteen days. A bacteriological examination of the tonsillar exudation resulted in the demonstration of the presence of streptococci.

This erythema may be due either to rheumatism or to other septic influence. On the other hand, it must equally be remembered that scarlatina is not always followed by desquamation, and that the kidneys are not always affected. The most characteristic point of diagnosis is glandular enlargement at the angle of the jaw in scarlatina, and the absence of such a system in simple tonsillitis.

It is not inappropriate to here note that *after removal of chronically enlarged tonsils*, symptoms are occasionally exhibited of pyrexia, sympathetic albuminuria, glandular enlargement, rash and desquamation, which are practically identical with scarlatina. In these cases, if a culture be taken, evidence will be afforded of a staphylo-coccal infection.

Phlegmonous Pharyngitis is often treated as tonsillitis, and the two diseases are indeed considered as one by Cohen, who uses the two terms synonymously. They may be differentiated by the history, by the marked asthenia, and locally by the fact that the peritonsillar tissue is affected rather than the gland itself in phlegmonous inflammation.

Measles and *German Measles* are often complicated with sore

throat, bilateral in character, but they are only rarely accompanied by tonsillar inflammation.

Syphilis.—On first consideration, it would hardly appear that there was much likelihood of a mistake being made between this disease and acute inflammation of the tonsils; but the possibility of error would not be suggested, had not I witnessed examples of it, both in the early secondary and in the acute tertiary forms.

The tonsils are often inflamed as part of the process of secondary manifestations; but a careful comparison of the symptoms, as described in these pages, especially with reference to the particular characteristic of secondary syphilis—symmetry of the mucous patches; and of the tertiary form—destructive ulceration—will enable the practitioner to avoid so serious a mistake.

Cancer.—In the distressing and comparatively rare affection of primary cancer of the tonsil, there is infiltration and enlargement of one gland only and of the surrounding lymphatics, with fœtor of breath, foulness of tongue, and difficulty of swallowing, which might well excuse an error of diagnosis on first presentment of the case. Here, again, a correct opinion will most often be arrived at by care in noting the history and general symptoms. Especially will it be remarked that the graver disease proceeds with slow and gradual steps, and has probably existed for some weeks instead of a few days, before advice has been sought.

In both *post-diphtherial* and *labio-glosso-laryngeal paralysis* the difficulty in opening the mouth, the thickness of speech, similar to that noticed in quinsy, the dysphagia, ejection of fluids by the nostril, and excess of salivary and mucous secretion, might all, at first sight, lead to an erroneous diagnosis. Inquiry into the previous history, the duration of symptoms, and physical examinations, will clear up doubts.

DURATION AND PROGNOSIS.—An attack of tonsillitis seldom lasts more than a week; but there is a great tendency to relapse, especially if the patient has been subjected to insanitary influences. One tonsil having been affected, and the attack having terminated by resolution, the opposite gland may, a few days later, become inflamed, and proceed the whole length of suppuration. Thus the illness may extend to two, or even three weeks. Gangrene never occurs in the form of tonsillitis here described. The prognosis as to recovery is almost invariably favourable, and convalescence is, as a rule, wonderfully rapid.

The patient must be warned that a first attack is but too often the forerunner of others, which may recur with almost periodical regularity.

combined with alkalies, as soda and ammonia, are much more serviceable than the stronger but less easily assimilated tonics.

Local.—Contrary to recognised traditions, the use neither of steam (except with Lee's instrument, p. 147) nor of spray inhalations is recommended, as the fatigue attending the act of inhaling far outweighs any probable benefit. Ice, again, although occasionally grateful, much more often aggravates pain and cramp.

Gargling, for reasons already given in the Chapter on Therapeutics, is not advocated. And, in the place of gargles, I recommend the more general employment of mouth-irrigations, by means of a proper syringe (Form. 73, 75, 77), of sprays, of lozenges, and, in the case of children, of medicated confections.

In cases of naso-pharyngeal stoppage and accumulation, the syringing of the nostrils with a Leffert's coarse spray (p. 161), or any small nasal syringe (p. 162) with a saline solution, is often attended with marked relief (Form. 74, 75, 77, and 78). Lemonade made from the fresh fruit and with a little sugar, taken through straws, is very refreshing, and is often sccessful in 'cutting the phlegm.' Guaiacum lozenges are serviceable in the early stages in producing resolution, but are only wearisome and useless when symptoms of suppuration are manifested.

Recently I have largely—indeed almost exclusively—employed *Guaiacol* (Methyl-Pyrocatechin). Guaiacol may be described as a purified form of creasote, and is applied in a solution —made of equal parts of the drug and almond oil (Form. 60) —on a cotton-wool brush, to the inflamed tonsils.

A sharply smarting pain is the first effect of the application. This lasts for but a few seconds, and is followed by a distinct anæsthesia of the parts touched by the solution; after a few applications any exudation present rapidly disappears, and the inflammation soon subsides. Indeed, I have seen many cases of tonsillitis, presenting every symptom of termination by suppuration, veritably aborted by a few applications of this remedy.

Amongst other recent remedies, the direct application of carbonate of soda in powder, lozenges, sprays, or mouth-washes in strong solution of the salt, gives speedy relief, especially in the presumably rheumatic varieties. Salicylate of soda in excess of alkali, as a mouth-wash, and menthol, as a spray, paint, or lozenge, are equally serviceable in all varieties.

Externally, severe counter-irritation, leeching, and other depletive measures, are to be condemned. External application of a stimulating liniment of ammonia, of the compound mustard liniment, or of the iodine liniment (B.P.), are, if employed early,

Cases of death from quinsy have been reported, but in all probability they have been due to association with more serious disease, especially with exanthematous affections, in which the eruption has not been developed. Very rarely, as in young children, death might occur from inanition; but, as already pointed out, the disease is not frequent much before puberty. There is the possibility also of death from hæmorrhage on the bursting of an abscess. Extension of simple tonsillar inflammation, however acute, into the larynx is a rare complication.

TREATMENT.—We have acknowledged the importance of certain anatomical divisions and distinctions of acute tonsillitis, by describing each of them in detail; but seeing that in all forms the characteristics calling for treatment are collectively similar, there is no necessity to consider the therapeutics of each variety separately.

General.—First, and all-important, is a thorough clearance of the *primæ viæ*, with the continuance of moderate purgation throughout the whole course of the attack.

Resolution may be greatly favoured by the early and frequent administration of one-drop doses of aconite (Form. 87). Guaiacum given in mixture, as first advised by Sir Thomas Watson, or in the form of lozenges (Form. 17), will be found to act both locally and constitutionally towards the same end, and its good effects appeared to me in former times to emphasise the correctness of the rheumatic theory. Nowadays, however, as to lozenges, I prefer those of menthol (Form. 18 and 19).

The renal secretion should be kept alkaline. In my first edition I stated that I had tried salicylic acid, which was then a new remedy, with encouraging results. Since that time I have had increased experience of the salicylic treatment, and generally adopt it as preferable to that by aconite—for one reason, that it is, in view of possible cardiac complications, not so depressing; secondly, it is of greater activity in subduing the pyrexia and of relieving pain, not only in the throat, but also in the muscles and joints, should these be involved (Form. 92).

Where there is marked depression, iron may be added to the saline mixtures; with the salts of salicylic acid I generally combine cinchona.

Salol (phenyl-salicylate) has been recommended as a safe and sure remedy in acute tonsillitis. Certainly it is more agreeable than the salicylates; but its physical characters, especially its insolubility, tend to contra-indicate its application in this disease. On recovery simple vegetable bitters, as gentian or calumba

mation. By this means the existent attack is at once cut short, and the chance of further recurrence avoided.

Prophylactic.—On occurrence of tonsillitis, in the case of children, the patient should at once be isolated until the nature of the case is clearly ascertained, and, with all, confinement to bed is desirable; but steam-kettles and thick curtains and screens are unnecessary and depressing. In view of the fear of general rheumatism supervening on the throat attack, great caution is to be exercised against taking a chill during convalescence. The hints already given of the liability to recurrence, and of the predisposing causes, will sufficiently indicate the necessity of cautioning the patient on recovery, on all matters of diet, climate, and sanitary surroundings. Sea air and Continental baths certainly help to diminish the tendency to development of the diathesis.

Seeing that constipation invariably precedes an attack of quinsy, it behoves the patient to pay particular attention to the regular daily action of the bowels. There is nothing better for this purpose than the natural saline aperient salts and waters—Karlsbad, Friedrichshalle, Hunyadi Jānos, Pullna, etc.

Acute Ulcerative Tonsillitis.

This subject has received much attention of recent years, and sufficient evidence has been published to establish it as a separate pathological entity. The affection is not usually accompanied by any well-marked febrile reaction, and, as a rule, the onset is insidious.

When first seen, one or sometimes both tonsils present an ulcer of the size of a threepenny to a sixpenny piece, covered by a creamy semi-caseous substance, greyish in colour, easily removed by a cotton-wool brush, and laying bare a raw mammillated surface. The borders of the ulcer are irregular in outline, with vivid red edges as if punched out, while the rest of the tonsil is not increased in size or apparently involved. This absence of peripheral inflammation is characteristic; in fact, the lesion appears to affect only a part of the gland. The base of the perfectly formed ulcer consists of small-cell tissue, permeated by numerous dilated vessels, whilst the edge shows piled-up squamous cells, undergoing active karyokinesis and vacuolation. The disease has been asserted to be of microbic origin, and is probably so, though the beaded bacilli described as found in the tissue at the top of the slough, have not so far conformed to the postulates of specificity.

Not uncommonly, two or more ulcers are present, which, although developing separately, may fuse; they are always fairly

deep. There is seldom any enlargement of the submaxillary glands; but often pressure over the neck, corresponding to the position of the tonsil, will cause acute pain.

The subjects of an attack are always weak, and more or less anæmic, a condition the **treatment** of which consists of analeptic measures. The course is somewhat tedious, and may last for two or three weeks; but **prognosis** is favourable, and recurrence is not common.

Chronic Inflammation of the Tonsils (Fig. 23, Plate IV.). —Enlarged Tonsils (Fig. 32, Plate IV.).

The first-named condition may result as the remains of an acute inflammation, or it may be due to a chronic disease of the lacunæ of the gland, tending to inflammation, dilatation, and obstruction of the crypts, with hypertrophy of the parenchyma. So-called chronic follicular disease of the gland—preferably *chronic lacunar tonsillitis*—does not, as has been already pointed out, necessarily imply glandular enlargement, and this occasional absence of hypertrophy is the reason why such cases are so obstinate of cure. More usually, enlarged tonsils are caused by an indolent catarrhal inflammation, occurring principally in scrofulous children, leading to enlargement and more or less induration; or it may be due to a true hypertrophy, with but very little, if any, inflammatory deposit, much as the lymphatic glands may become enlarged without going the length of inflammation and disintegration.

Hypertrophies of the tonsils admit of an arbitrary grouping, which is useful when considering surgical procedures. The following are my subdivisions, according to their clinical appearance, and may be conveniently adopted:—

1. The **peninsulated** or **projecting.**—These have a somewhat slender base, are round or globular in form, and the buccal surface of the glands is smooth.

2. The **Cowled.**—This term, derived from Moure, is applied to those cases of hypertrophy of the tonsils in which the upper part of the anterior faucial pillar—the front boundary of the *supra-tonsillar fossa*—forms a sort of cowl or covering to the enlarged gland: as it nears the tongue the tonsil broadens and is often adherent to the lower portion of the pillar, to such an extent as to render it difficult to differentiate between anterior pillar and border of tonsil.

In this group the *bi-lobar* and *supernumerary* tonsils are in-

cluded; though neither the lobulation nor the supernumerary gland favours any particular situation.

3. **Honeycombed** or **ragged tonsils** containing cul-de-sacs, in which caseous or calcareous concretions are often present. These are generally the forms of chronic hypertrophied tonsils which are particularly liable to periodic attacks of acute or sub-acute inflammation.

Hospital statistics of relative frequency show that chronic hypertrophy of the faucial tonsils constitutes nearly 11 per cent. of all patients treated in a special hospital for diseases of the throat, nose, and ear; 23 per cent. of all diseases of the throat and larynx; and 37 per cent. of diseases of the faucial and pharyngeal regions.

As a rule, disposition to all tonsillar inflammation decreases with advance of years; but I have met with several notable exceptions.

CASE XXXIV.—One that impressed me was that of a maiden lady of middle age, seen nearly fifteen years ago in consultation with Dr. Davy, of Walmer. The tonsils were not enlarged, but both, particularly the left, were inflamed, with several points of cryptic obstruction; some pain in swallowing and in other functional acts was experienced. An alarming diagnosis of cancer, with a prognosis of only three or, at most, six months of life, had been made; but I had little hesitation in giving a much more favourable, though equally positive, opinion. On learning it, Dr. Davy was told by the other practitioner in question that he was content 'for time to be the arbiter between us.' I, however, urged yet another consultation, and Dr. George Johnson was selected by the patient. His opinion was promptly enunciated as confirmatory of mine. Treatment on the general and local principles to be presently detailed was adopted. The patient very soon recovered, and was still living, ten years later, in excellent health.

MORBID ANATOMY.—The so-called chronic diseases, or inflammations of the tonsils, whilst presenting several distinct clinical and histological features, are generally the results of either acute or sub-acute attacks of inflammation, or as representing a simple congenital enlargement. One must not ignore the possibility, too, of its being merely the local expression of a constitutional diathesis. It is possible to clearly define three chief types—

(1) Interstitial or sclerotic; (2) lymphoid; (3) lacunar.

These names sufficiently indicate the nature of the morbid changes, although it not unfrequently happens that their co-existence and variation render both clinical and histological classification somewhat difficult. For example, mycosis tonsillaris may exist with each type or with their combination, whilst an exaggeration of the lacunar variety, with interstitial sclerosis, presents another sub-variety known as *cystic*.

1. The **Interstitial** or **Sclerotic** form of chronic enlargement is obviously a slow inflammatory process, the outcome of recurrent acute exacerbations, both suppurative and abortive. The normal grouping of the lymph pulp and nodules is more or less lost, and

the bulk of the organ is seen to consist of fibroid tissue radiating in all directions, but often occurring as a specially thick zone below the surface epithelium. The lymph pulp or interfollicular tissue exhibits two distinct changes; in one part close to the crypt it is condensed, and the lymphocytes are apparently multiplied; while in another, more central, the lymphocytes are few, and the meshes of the stroma with the capillaries are widely dilated. The core is particularly rich in dilated and attenuated blood vessels.

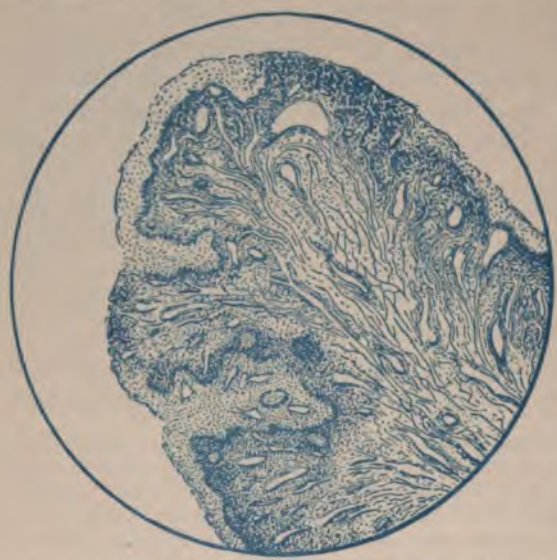


FIG. CLXXIII.—CHRONIC INTERSTITIAL OR SCLEROTIC TONSILLITIS (½ *in. Obj.*).

The **lymphoid** variety in early life consists of a simple hypertrophy of an otherwise normal structure (Fig. CLXXIV.), and co-existing with enlargement of other lymph organs. But, as it eventually becomes the seat of inflammatory changes, it may assume any of the other types. The normal grouping of the tonsil elements becomes less clearly defined.

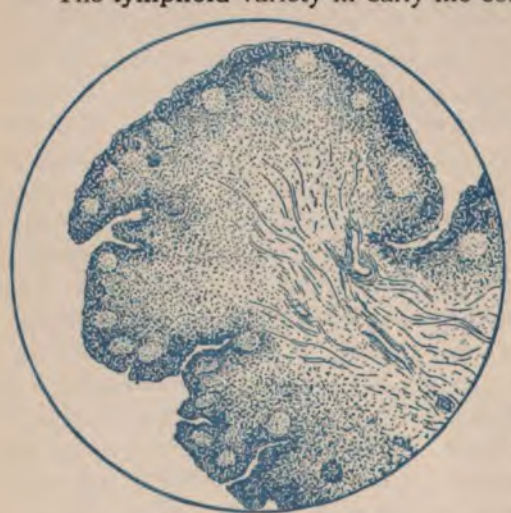


FIG. CLXXIV.—CHRONIC LYMPHOID HYPERTROPHY OF TONSIL (½ *in. Obj.*).

The **lacunar** variety presents many interesting and well-marked histological features.

Although the morbid changes may in the first instance be confined to the

lacunar epithelial cells, the parenchyma of the organ suffers sooner or later.

Perhaps the commonest form is that which, from its macroscopic appearance, may be termed the 'honeycomb' tonsil. The lacunæ are greatly distended, and often filled with caseous matter, which can be easily squeezed out. The tonsil seems to be burrowed in all directions, for a probe will pass deeply into its substance, and communicate laterally with several other holes.

Under the microscope, the lymphoid structures may be normal or atrophied to a variable extent from pressure or fibrosis; whilst the lacunæ exhibit a most interesting variety of changes. The epithelial cells are in a state of chronic activity, shown by a

FIG. CLXXV.—CHRONIC LACUNAR TONSILLITIS (½ *in. Obj.*).

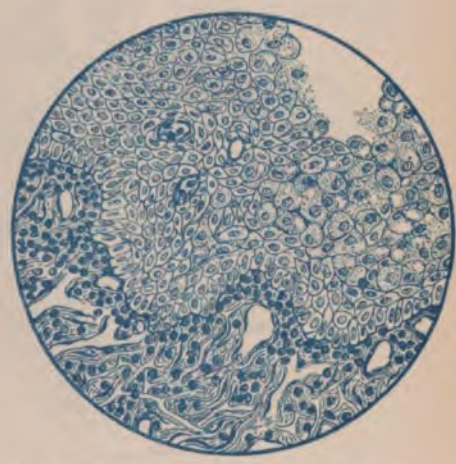


FIG. CLXXVI.—CHRONIC LACUNAR TONSILLITIS (⅛ *in. Obj.*).

distinct thickening of the layers and accumulation of the dead cells, which block and distend the lumen as with plugs. These cells may become horny (*Keratosis lacunaris*), and retain their stratified character, or they may undergo fatty changes (*Atheroma* or *Cholesteatoma*). The caseous nodules consist either of these scaly masses, or else of amorphous granular fatty matter (dead leucocytes) mixed with leptothrix, various other rods and cocci, and a few dead squames. In rare instances they may be calcified and form miniature calculi.

In very chronic cases the epithelium and its subjacent tissue undergo localised thickening, invading the surrounding lymph, and forming a distinct papilloma, which obscures the identity

of the lacuna; this may eventually reach the surface, and form a pedunculated structure or a papilloma. Sometimes the distension of the lacunæ may be so exaggerated that a series of *cysts* (Fig. CLXXVII.) may form with caseous or semi-fluid contents. Neither these cysts, however, nor the caseous masses, always originate in the lacunæ, for they may be due to inflammation, with subsequent caseation and liquefaction of the *lymph nodules*, a process strongly suggestive of strumous lymphadenitis, with which it is often associated, and is probably identical.

These lacunar changes being evidently the outcome of some irritating influences, probably of constitutional as well as of local origin, the question naturally arises, as to how far the micro-organisms there found are responsible.

FIG. CLXXVII.—CHRONIC CYSTIC HYPERTROPHY OF THE TONSIL (½ *in. Obj.*).

A form of chronic enlargement occasionally occurs, in which the lymphoid elements are replaced by distended blood and lymph vessels, whilst the lacunæ are obliterated by epithelioid hypertrophy. In these cases the normal lymph nodules also disappear.

An interesting histological feature, associated with chronic tonsillitis, is the presence of certain so-called vegetable parasites (*blastomycetes*), described by De Simoni as being probably responsible for the morbid changes.

These organisms (whose existence we have verified), when stained by Gram's method, appear as violet hyaline spheres, varying in size and grouping. They are not seen in healthy tonsils, but are, on the other hand, so plentiful in chronic inflammation occurring in other regions, *e.g.* rhinitis in its different varieties, lingual papillomata, lupus, etc., that their causal relation to chronic tonsillitis is equivocal. It may also be noted that these hyaline spheres closely resemble the organisms described

by Russell, Rueffer, and others, as occurring in malignant formations.

SYMPTOMS: A. **Functional.**—The subjective signs of chronically enlarged and inflamed tonsils need hardly be elaborately described, since the physical evidences are so easy of detection.

Voice will be husky, toneless, and easily fatigued; when there is hypertrophy, it will be thick, guttural, or nasal, and will generally be high-pitched.

Articulation will also be interfered with, the patient speaking as with a full mouth, and having great difficulty in pronouncing palatal consonants.

Respiration can never be carried on healthily where the tonsils are diseased, since all inspired air passes over an unhealthy surface, while the narrowed naso-pharynx leads to mouth-breathing. There is always nasal stenosis, a condition aggravated by the almost invariable presence in children and adolescents, and even in adults, of post-nasal adenoid growths.

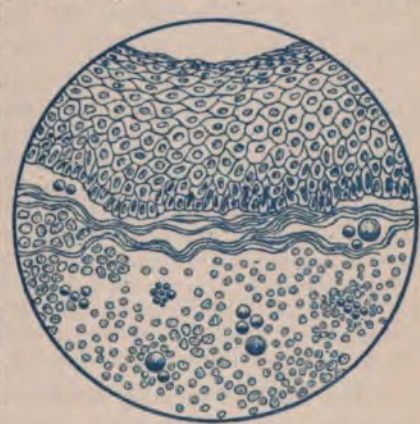


FIG. CLXXVIII.—HYALINE BODIES IN CHRONIC TONSILLITIS (⅛ *in. Obj.*).

Where enlargement is considerable, the lungs are never fully aerated, the chest-walls become narrowed, and the breast-bone is prominent; the patient is torpid and lethargic, and is very liable to attacks of pneumonic congestion. It is not often that respiration is impaired to the extent of really alarming symptoms of suffocation, but

one such case has been recorded by Wesley Mills as having occurred in a child three years of age. The attacks generally occurred while eating, but at night also attacks of coughing and suffocating spasms were so frequent as to cause alarm lest death should result.

Nasal respiration is generally greatly impeded from the obstruction, as well as from concurrent hypertrophic rhinitis and adenoids, which cause the patient to snore loudly in sleep, to awake with a dry throat and mouth, and to breathe audibly during the day, with the mouth wide open; this last, in association with *aprosexia*, giving a characteristically stupid expression to the face. Attention has been drawn by some writers to the flattening of the nasal bones, due to insufficient openness of the naso-pharyngeal space, and the appearance is considered by them

distinctive; this condition is, however, often observed in other diseases which cause obstruction in the nasal passages. The alæ of the nose are often pinched and dimpled from disuse.

Panas has reported a case of double inflammation of the lachrymal glands, both being affected at the same time. He believes that the inflammation was not due to direct—but to general—infection, the seat being the diseased tonsils. Excessive lachrymation and epiphora are not necessarily due to such infection, nor to any disease of the lachrymal gland itself, but to a blocking of the nasal duct at the intra-nasal site of communication with the nares. This fact will also explain most of the milder ophthalmic conditions referable to naso-pharyngeal adenoids.

Cough is not a common symptom, but I have seen a few instances of severe spasmodic cough, sometimes simulating pertussis, due to reflex irritation from enlarged tonsils.

CASE XXXV.—One very remarkable case came under my notice in December 1876. It was that of a little boy, æt. 10, who had suffered from constant 'hemming' of the throat for about twelve months, and from persistent dry barking cough without expectoration, very similar to that known as hysterical, for the last six weeks. So persistent was this cough, that it would recur in the intervals of eating at meal-times, and the moment he awoke at night. The little patient had been under the care of two able family practitioners, and had been treated for stomach-cough, tooth-cough, thread-worms, and every other conceivable cause for the irritation, all without the slightest benefit; the boy was becoming exhausted, was losing appetite and flesh from want of sleep and the ever-present distressing cough. On looking into his mouth, the tonsils were seen to be very much hypertrophied; and failing, on examination, to find any other abnormal condition, they were, with the consent of the father, then and there removed. From that moment the child lost his cough.

Two almost exactly similar cases came under my notice in the year 1886, each little patient being the child of a medical confrère. In both, the success of treatment by removal of the cause was as complete as in the case narrated. Recent experience leads me, even when the tonsils are not much enlarged, to suspect adenoid growths in all cases of reflex spasmodic cough. Cases confirmatory of this view, as well as of the immediate success of surgical measures, are now of frequent occurrence.

CASE XXXVI.—The patient, a lad æt. 13, was sent to me by Mr. Freeman of Reading. He was training for the Navy, but a constant cough, which had existed for several months, so upset both his master and the whole class, that he was practically debarred from instruction. The tonsils were only very slightly enlarged, but the vault of the pharynx was blocked by adenoids. Surgical removal has been followed by complete and apparently permanent cure.

Deglutition is seldom painful, but generally uncomfortable, especially on the slightest recurrence of inflammation. There is unusual sensitiveness to food at high temperature and of piquant character. Another characteristic of enlarged tonsils is that there is a desire to take fluid very frequently during eating, so as to

assist the passage of solid food; and there is often a difficulty, especially with young children, in swallowing any but the most minutely divided portions.

The **senses** of **hearing,** of **smell,** and of **taste** are all more or less impaired. One very common cause of deafness is obstruction of the Eustachian tube, due to enlarged tonsils. It is not, as has been already pointed out, that the enlarged tonsils themselves obstruct the Eustachian orifice, but there is usually, with such a condition, the association of disordered secretion with chronic hypertrophic inflammation of the naso-pharynx, and a strong tendency for the catarrhal inflammation to attack the lymphoid tissue around the ostium of the tube and to extend to the middle ears. In these cases, also, there is not unfrequently a disposition towards accumulations and impaction of cerumen in the auditory meatus.

Pain is rarely an element of chronic tonsillar disease or of enlargement; but Andrew Smith has reported a case of neuralgia traceable to this cause, and cured by its removal. Subjective sensations of foreign bodies in the throat, and frequent efforts to dislodge accumulation of mucus, are very frequent. Mention may here be conveniently made of painful glandular enlargement of the neck, generally one-sided, which is sometimes, but rarely, caused by the presence of benign hypertrophy of the tonsils. I have seen a few such cases, in which prompt reduction of the swelling following tonsillotomy has confirmed the diagnosis of association.

B. **Physical.**—On looking into the throat, the cause of all the foregoing symptoms is at once apparent. One or both tonsils are seen to be more or less enlarged and inflamed, and in a corresponding degree to obstruct the faucial opening. They are often studded with several open crypts, some of them filled with white or yellowish white matter: when pressure is made, this matter is seen to exude in cheesy-looking masses of very offensive odour. In the adult these open and inflamed crypts may sometimes be so large as to give rise to a doubt as to the non-syphilitic nature of the disease. A careful examination, revealing other lacunæ in a less advanced state of inflammation, will dispel such a fear.

C. **Miscellaneous.**—The general health, as has been indicated, may greatly suffer from such a cause; every function of circulation, respiration, and digestion being performed in a sluggish manner, nutrition consequently becomes greatly impaired. The main cause of deterioration of health is the disturbance of the patient's rest at night. Sleep in the earlier hours is restless, and often broken by the loud snoring which will even awake the subject himself; but towards morning the sleep is very heavy,

and the patient is often with difficulty aroused, a circumstance probably arising from passive congestion of the lungs, due to obstructed respiration and imperfect aeration. There is usually the history of one or both parents, and of other members of the family, suffering, or having suffered, from a similar tendency to enlarged tonsils, and the diathesis is either rheumatic or strumous.

TREATMENT of **chronic lacunar disease** is very tedious and unsatisfactory. Where the tonsils are *not hypertrophied*, it has been proposed to squeeze out the cheesy secretion from each diseased crypt, and then to apply solid nitrate of silver or other caustics—preferably the galvano-cautery if available—to the cavity. Such measures are, however, but too frequently only tentative, and not of permanent benefit. It is better to treat such a case on general principles, according to the diathesis, and to allay local symptoms by lozenges of guaiacum, menthol, carbolic, or chlorate of potash. Whenever (as is almost certain to occur) active inflammation causing enlargement takes place, it is to be

FIG. CLXXIX.—THE TONSILLAR PUNCH FORCEPS.

rather encouraged than arrested, and the gland then removed. In other cases, destruction of the diseased tissue is best effected by applications of galvano-cautery, repeated as required at intervals of a week; or the gland may be removed piecemeal by means of a tonsillar punch (Fig. CLXXIX.).

Chronic enlargement of the tonsils is only to be treated satisfactorily by the one method of excision, and there does not appear any valid reason why there should be two opinions on the question. The operation is simple; it is accompanied with little pain; and this can easily be escaped under the anæsthetic influence of nitrous oxide gas, or it can be modified by cocaine; the result of the removal is speedily and almost always of permanent benefit. All measures of local applications, 'removal without cutting' by caustic pastes, 'injections into the substance of the gland,' are useless, and some of them barbarous. This last objection certainly does not obtain in the case of electrolysis, or in application of the

continuous current without needles; but such a process is too tedious and troublesome to be recommended for general use.

Excision is best performed with a guillotine (Fig. CLXXX.), the patient's mouth being kept open by the indispensable Wingrave prop, and the head being held by an assistant, who, standing behind, at the same time presses in the gland from without, on the side on which the surgeon is operating. This gives a firm *point d'appui*, and avoids the necessity of employing forceps; when an anæsthetic is employed, the administrator standing behind, can render this assistance when narcosis has been induced.

FIG. CLXXX.—TONSIL GUILLOTINE, IN POSITION FOR OPERATING ON THE LEFT TONSIL.

I believe I can claim to have first adopted the position and procedure of the assistant which is here recommended; since it has become generally recognised—at any rate in this country—as the best. It has quite superseded that of Morell Mackenzie, who advised that 'the surgeon, with the thumb or index finger of the left hand placed under the angle of the patient's jaw, then presses the tonsil inwards, whilst at the same moment, with the thumb of his right hand, he drives home the blade of the tonsillotome.' Prior to that, and I believe still in Vienna and other continental cliniques, an assistant pressed down the tongue with his finger, or with a spatula, whilst the surgeon seized the tonsil with a vulsellum, and, drawing as much as possible towards the median line, cut off the superfluous portion on a level with the pillars of the fauces by means of a pair of scissors. After a time the scissors gave way to the bistoury, but some surgeons still operate with knife and forceps.

So-called double guillotines, constructed to remove both tonsils at once, like most instruments that attempt too much, often fail to be of any use whatever. When it is required to remove both tonsils, it is better, having excised one, to withdraw the instrument, dislodge the removed gland, and to quickly re-introduce the guillotine on the opposite side, before the patient realises that there is a second operation or recovers from the anæsthetic, and also before hæmorrhage sets in. By this measure one operation and one sore throat only are necessary, and the risk is avoided of a young patient refusing to allow of a repetition.

Where the gland is very large, and especially where it grows down along the side-wall of the pharynx, it is not always possible to get the rigid ring quite round the tonsil. In such a case a wire-loop écraseur as here depicted (Fig. CLXXXI.), answers admirably, and quite obviates all risk of hæmorrhage. I employed the galvano-cautery loop in one instance of this kind, but found that, while there was no advantage over the ordinary écraseur, the after-pain of the eschar was much greater, for it was impossible to avoid scorching the faucial pillars. It is not therefore to be recommended.

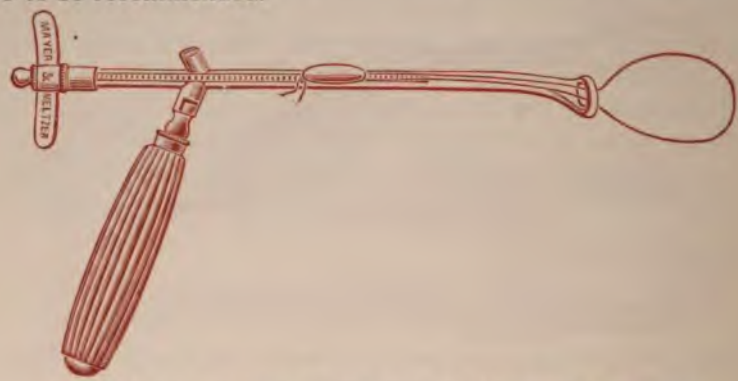


FIG. CLXXXI.—AUTHOR'S WIRE-LOOP ECRASEUR FOR ENLARGED TONSILS (HALF MEASUREMENTS).

Very rarely indeed is there a re-development of the hypertrophy; but as such a circumstance is not outside my experience, I always endeavour to remove as much of the gland as can be pressed into the guillotine, and I would deprecate the advice of some surgeons that the removal of a 'slice' off the tonsil is sufficient to ensure the atrophy of the rest. Removal is made more easy if a guillotine or wire-loop is chosen rather *under* the size of the gland, which is thus on pressure the more completely encircled and fixed before the cut is made. By this precaution also the risk of wounding the faucial pillars is avoided.

Regarding the question of **hæmorrhage**, I can but say that it has been most rare in my experience. I have an aggregate knowledge in my own practice and that of my colleagues of fully fifty thousand cases; and in the thirty years or more over which these cases have been spread, I have only seen and known of three or four cases in which the bleeding has been serious, and only one in which it was at all alarming. The most troublesome case I ever saw was brought about by irritation from a crumb of toast. All food, therefore, for a day or two must be soft in

consistence and of mild temperature. In another instance—that of a domestic servant—bleeding occurred on the third day after removal, while she was kneeling and cleaning door-steps. Two other causes may be named—a too capacious fenestration of the instrument, by which the anterior faucial pillar is wounded; this circumstance giving rise to immediate bleeding, not dangerous, but difficult to arrest; the second is the occasional formation of a slough, which, on removal, exposes a raw and bleeding instead of a healed surface. This accident is generally the result of septic infection of the wound.

Lefferts, who has treated this subject with some detail and with impartiality, takes a more serious view of the question; he thus summarises his experience:—

'That though the operation of tonsillotomy, thoroughly performed, is usually unattended by untoward result, still it is not entirely free from alarming, sometimes dangerous results; and that though these be the exception, they should not be ignored; and that the surgeon must always be prepared, both mentally and manually, to cope with a hæmorrhage that may unexpectedly occur.'

T. Wright of Boston, who has compiled some very elaborate statistics of hæmorrhage after tonsillotomy, states that in twenty-five years thirty-one cases were reported to the Surgeon-General; this is an average of 1 in 3000 cases. One case occurred in a child the subject of hæmophilia, another was a case of abnormality in the internal carotid artery. Twenty cases occurred in persons 18 years of age, or over.

Butler of New York, Blair, and Fuller, have all reported cases of alarming hæmorrhage. In Fuller's case the patient was a hæmophile.

Harrison Allen has noted four cases of abnormality in the arterial supply to the tonsil, and advises the operator, before commencing, to examine the parts with the finger, placed if possible between the tonsil and posterior wall of the pharynx, to endeavour to detect any abnormal pulsation.

W. H. Daly picturesquely and pithily expresses his opinion that the surgeon who says he has never yet had an alarming hæmorrhage after this operation 'has yet to meet his Sedan.'

It would not be right to omit the statement that a few extreme cases are on record in which the hæmorrhage after tonsillotomy has been fatal, and that in others it has been necessary to tie the common carotid. It has, however, to be borne in mind that in all, or almost all, these serious cases the bistoury has been employed in place of the much safer guillotine. It is quite impossible to determine whether excessive hæmorrhage, when it occurs, depends on an increased vascularity, due to the general hypertrophy, to an abnormally superficial distribution of the tonsillar artery, or, where a bistoury is used, to a wounding of this vessel at its anastomosis with the lingual. In view of the possibility of any of these accidents—as well as of the occurrence of other avoidable sequelæ, due to insanitary homes, in the case of operations on *out-patients*—it has for some years been a rule of my hospital colleagues and myself

to insist, wherever feasible, on residence for a few days in the building, or, in the case of private patients, within our reach.

Should bleeding occur, similar treatment to that recommended after removal of the uvula is to be adopted, namely, the sipping of a saturated solution of tannin (Form. 4), In one instance in which this measure failed, I substituted with success the 'styptic colloid.' The secondary hæmorrhage which may take place a day or two after removal, is as a rule easily stopped.

This procedure is, however, very tedious to the patient, and involves very prolonged watching on the part of the surgeon. Macintyre has informed me that in a recent case of hæmorrhage after tonsillotomy in an adult—in whom, by the way, it is much more prone to occur—he promptly arrested the bleeding by passing a needle threaded with a long whip-cord ligature through the anterior faucial pillar, the stump of the tonsil, and the posterior pillar, securing the two ends, which were cut off short.

The measure particularly recommended by Lefferts is pressure within the mouth with concurrent counter-pressure externally.

It may be asked, 'Is the knife or guillotine the only method of excising enlarged tonsils?' My objections to the use of the hot wire have been already stated, and more than once; but while I can appreciate the possible advisability of this procedure in the case of a patient with a known hæmorrhagic tendency, as advised by Knight, I cannot subscribe to Moritz Schmidt's recommendation in his recent work, of its use in ordinary cases of enlarged tonsils occurring in children. Lichtwitz also advocates the use of the hot wire. Such treatment is, indeed, only mentioned for the purpose of expressing unqualified condemnation.

The surgeon is often asked, 'Are any ill effects likely to take place after removal of the tonsils? Will the patient be more liable to suffer from cold, or to contract diseases such as diphtheria? Will the voice be likely to suffer?' To all such questions most positive answers may be given, that nothing but ultimate good can follow from this operation in suitable cases.

It would, perhaps, hardly be credited that prejudice still exists against this operation, from a belief that it may arrest sexual development. Such an ignorant thought was suggested to the parents of one of my patients, *after* the operation, by a homœopathic practitioner; and the question was even thought worthy of occupying the greater portion of a sitting of the Clinical Society of London in 1886. It is not necessary to confute this remnant of tradition with serious argument, but it is interesting to allude to the fact that Chassaignac long ago pointed out

that, while hypertrophy of the tonsils tends to arrest sexual development, their removal favours it.

Mycosis Tonsillaris (Mycosis Buccalis, Mycosis Pharyngis Leptothricia).

This disease is characterised by the growth in the faucial region of patches of one or more varieties of leptothrix belonging to the *schizomycetes* group of bacteria. This fungus is generally assumed to be non-pathogenic, and must be considered as the associate rather than the cause of any tonsil trouble which it may accompany. Although the organism is held responsible as a predisponent to recurrent attacks of lacunar tonsillitis, and is indeed rarely to be found except in patients who are the subjects of the chronic form of tonsillar inflammation, this does not

Fig. CLXXXII.—Mycosis of the Faucial Tonsils and Fauces.

Fig. CLXXXIII.—Mycosis of the Lingual Tonsil.

justify the assumption that mycosis tonsillaris is a disease, *sui generis*, either acute or chronic, as has been suggested by Siebenmann, Kelly, and others. In fact, in the majority of cases, the existence of the fungus may only be discovered by some fortuitous occurrence, as in a recent example—

Case XXXVII.—In which a patient, sent to me by Dr. Rout, anxious about his wife's throat, was led to look at his own, when he found what led him to believe was an infectious angina in his own person. He was in fact the subject of a rather more than usually abundant crop of leptothrix, the portrait of which is given in Figs. CLXXXII. and CLXXXIII.

The fungus is not necessarily responsible for disease of the tonsils any more than for dental caries or pulmonary gangrene, in both of which it occurs abundantly. There are doubtless certain local conditions favourable to its growth in the fauces, since it selects and persists in certain spots, in spite of efforts at removal.

Healthy tissue is certainly unfavourable to its development, whilst dead epithelial cells seem to afford the most suitable nidus—the cell products, toxins, etc., supplying a favourable nutrient. It may be that the crypt walls being diseased, the (supposed) outward stream of leucocytes is lessened, and scavenging is consequently imperfect. Acidity of saliva has been suggested as a predisponent factor, but the statement is not only inconsistent with recognised bacteriological data, but has been negatived by special observation.

The leptothrix is constantly found in various regions of the mouth, especially the teeth. It is, however, by no means a constant associate of chronic lacunar tonsillitis, as is shown by the fact that the caseous nodules from the crypts but seldom give

FIG. CLXXXIV.—SECTION OF TONSIL CRYPT, CONTAINING MASSES OF LEPTOTHRIX (⅓ *in. Obj.*).

FIG. CLXXXV.—LEPTOTHRIX IN SITU (⅛ *in. Obj.*).

the blue reaction of leptothrix on the application of Lugol's or other iodine solutions; not that this test is absolute, since a slight accumulation of starchy food in the fauces would confuse it.

Microscopical Appearances. — The filaments sometimes appear as flexuous ribbon-like bundles mingled with groups of various cocci, epithelial squames, and granular amorphous *débris*; at others, scattered irregularly amongst the lacunar contents, but never in the subepithelial structures (Fig. CLXXXIV.); they seem not to possess any power of invading living tissue. The stratified epithelial lining of the lacunæ is always thickened, frequently showing papillary elevations, from which the leptothrix is attached, to grow either in a more or less regularly radiate manner, or the condition described as kratosis (Figs. CLXXXV. and CLXXXVI.).

The filaments, when stained with methyl-blue, or by Gram's method, are seen as segmented or articulated bacilli, 1 to 20 μ (Grechleller) in length. They liquefy gelatine, in which they grow very slowly. Animal inoculation has proved unsuccessful, as also auto-inoculation, which has been pursued by a few enthusiastic observers.

Other varieties have been described, varying in size, shape, and cultivation tests (*Gladothrix*, *Bacillus buccalis maximus*, etc.).

CASE XXXVIII.—St. George Reid found the *Bacillus coli communis* as the predominating micro-organism in a case under my care of chronic lacunar tonsillitis, which closely resembled mycosis in its clinical features.

Leptothrix will thus be found to occur chiefly in two varieties of chronic lacunar tonsillitis—(1) A simple catarrhal state of the crypts; and (2) a horny hypertrophy of the lining epithelium. Either condition—especially the former—may assume an acute or subacute state, and even be attended with some constitutional symptoms; this is often followed by complete disappearance of the fungus, whilst at other times, especially in the keratoid form, it persists in spite of all treatment.

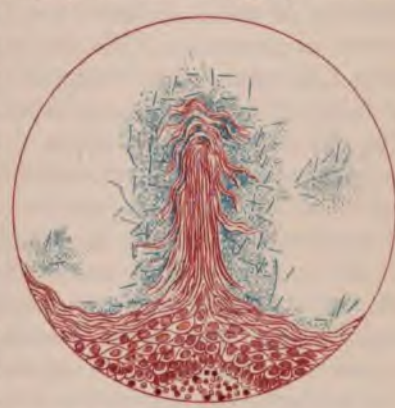


FIG. CLXXXVI.—KERATOSIS OF TONSIL WITH LEPTOTHRIX ($\frac{1}{8}$ *in. Obj.*).

Keratosis is marked by a papilliform process growing either from a chronically inflamed lacuna of faucial and lingual tonsils, or from a dilated gland duct in a state of catarrh (Fig. CLXXXVI.). The fibrous core is covered by stratified epithelium, grouped as densely-packed horny squames, which simulate the characteristic appearances of a 'prickly wart.' In transverse section these masses appear somewhat like the concentric pearls of an epithelioma. Each 'prickle' is invested in a close felt-work of leptothrix. When the crypt only shows catarrhal changes, horny cells are rare, and the leptothrix is mingled with vacuolated and fatty epithelial cells, together with clusters of other bacterial forms common to the oral cavity.

Etiology.—All sorts of causes have been ascribed for this affection, some of which are rather incongruous. Albeit the general health of persons in whom leptothrix is found is for the most part excellent, attacks have been more or less directly and

indifferently ascribed to influenza, struma, indigestion, and pregnancy. Among local causes not already named may be mentioned diphtheria, and, as predisponents, a pre-existing modification of the mucous membrane—pharyngeal and naso-pharyngeal catarrh. But there still remain a large number of cases in which careful endeavours have failed to account for the lesion.

There are literally no **subjective symptoms** which can be ascribed to the leptothrix pure and simple, and this circumstance confirms the diagnosis. Whatever distress or discomfort may be felt, is an indication of a more or less acute exacerbation of the chronic lacunar inflammation.

Physically, 'mycosis,' in its acute state, is represented by soft, creamy, and easily removed patches on apparently healthy mucous membrane; whilst 'keratosis' is characterised by the presence of small, isolated, tough, firmly adherent, white excrescences or plaques. The size and shape of these excrescences vary, and seem to be influenced to a certain extent by the site,—and, it might be added, probably by the duration of the disorder. The differences of size range from a slightly elevated pin-point to more or less elongated outgrowths, and are of shapes variously described as a prickle, horn, or finger; they may resemble tufts or brushes, or they may have a clubbed end with slender pedicles.

It is important to repeat that chronic lacunar tonsillitis is an almost constant forerunner or companion of keratosis; and that the ordinary soft caseous secretion of the former may occasionally be seen blocking some crypts, to be easily squeezed out, while the horny growths of the latter may occupy others, where they may be so firmly adherent as to be with difficulty detached.

Treatment.—A mouth wash, lozenge or gargle of potassium-chlorate, sulphurous acid, or some other mild antiseptic (Form. 8, 3, 9), expedites the disappearance of the fungus; but where, as is not infrequent, the fauces and uvula are inflamed, I know nothing better than one or two applications of the guaiacol pigment (Form. 60).

In the case of keratosis, the surgeon should first endeavour to dislodge each little prominence with forceps, not an altogether easy process, since the tufts may often break off short, or require so much trouble to detach that a complete clearance can seldom be effected at a single sitting. Removal must be followed by destruction of the point of origin, which can best be effected by the galvano-cautery point; should this not be to hand, chromic or other acid may be used with the same intent, though this kind of application often fails, from its liability to spread, to the injury of adjacent healthy structures. Nitrate of silver is not to be

recommended, and tannin is inert. Salicylic acid is much vaunted. Efforts at a complete 'cure' are often tedious; but, once successful, there is but little fear of recurrence. Where the tonsils are large, their removal is a sound and efficacious procedure.

Atrophy of the Tonsils.

This condition, as truly stated by Wagner, has been practically but little investigated. In justification it may be pleaded that it is only *hypertrophy* for which the surgeon's aid is usually sought; and since it is further allowed that many observations go to prove that persons with congenital or acquired atrophy of the tonsils are less subject to almost all the diseases of the tonsils, especially the ordinary inflammation—diphtheria and its associates, and syphilis—it is not surprising, nor to be lamented, that '*clinically*, atrophy of the tonsils has received but little attention.'

Only one variety described by Wagner under this head is of interest in relation to treatment—that in which there is dilatation and blocking-up of the lacunæ, without corresponding adenoid hypertrophy; but this affection—known to English surgeons as *chronic follicular (lacunar) disease of the tonsils*—is well recognised, and has already received full consideration in these pages.

To attribute morbid qualities to the atrophic condition, it must first be proved that the tonsils possess functions necessary to the life of the individual, and that the animal suffers from their disappearance. This has still to be done; and since their congeners in the pharynx are to be considered as embryonic vestiges, which undergo gradual suppression, exception can scarcely be made in favour of the faucial tonsils. These glands undoubtedly show both hypertrophic and atrophic changes common to other lymphoid structures, as is witnessed, the one in chronic lymphadenitis, the other in atrophic rhinitis. But it has to be shown that the association is more than coincidental, or that tonsillar atrophy has any causal relation to, or is followed by, any morbid phenomena.

Benign Neoplasms of the Tonsils.

Four chief varieties occur in this situation, namely (1) Lymphomata; (2) Fibromata; (3) Papillomata; (4) Angiomata. At least one case each of **lipoma** and of **myxo-sarcoma** has been also reported.

Lymphomata may be present as mere local manifestations of a general dyscrasia, or as independent growths.

Histologically they are simply hyperplasiæ of the lymphoid tissue in which they arise. The normal tissue seems to be endowed with an excess of activity, whereby its bulk is increased, whilst the minute structure retains its normal characters; any deviation being due either to accidental inflammation or to pressure. Occasionally, however, the lymphoid cells are more numerous in proportion to the stroma; and the normal arrangement being lost in this case, the tumour represents either a rapid enlargement, such as is found in leukæmia and Hodgkin's disease; or it may be a true neoplasm, heterologous in structure and with a suspicious resemblance to lympho-sarcoma. The utmost caution must therefore be made in interpreting the histological evidence of all lymphoid or small cell-tissue growths of the tonsils. The two drawings appended are sufficient to point out this liability to confusion.

FIG. CLXXXVII.—LYMPHOMA (⅛ *in. Obj.*).

FIG. CLXXXVIII.—LYMPHO-SARCOMA (⅛ *in. Obj.*).

Fibromata.—These growths generally occur in the tonsils as superficial peninsulated masses, either resembling polypi or as small, smooth, sessile processes. They are for the most part associated with chronic inflammatory changes, and are scarcely worthy of the name fibroma; but although by no means so uncommon as at first supposed, have until recently escaped a record. A true fibroma is one originating in the tissue of the tonsil itself in which it is embedded, and in this form fibromata are extremely rare.

Fig. CLXXXIX. represents one of these, of the polypoid variety, as it is seen to emerge from the interior of a crypt. This specimen started as a papillary elevation of the lining of a lacuna, and increased until it projected about an inch beyond the surface of the tonsil.

Histologically it consisted of fibro-vascular tissue showing signs of mucoid degeneration.

Papillomata are certainly not frequent, but are far less uncommon than has been generally assumed, also few examples having been recorded, although growths of the same nature are frequent on both the palate, uvula, and fauces. They are generally of the fimbriated variety, and may grow from the surface of the tonsil or from a crypt, commencing in the same manner as a polypoid fibroma. They do not stand out from the gland, but are generally seen to lie on the surface, hanging by a slender pedicle (Fig. CXC.), and, partaking of the pink colour of the surrounding mucous membrane, are liable to be overlooked.

Histologically they resemble ordinary warts, consisting of a central fibro-vascular core, splitting up in minute papillary projections, and surmounted by stratified epithelium, which may

FIG. CLXXXIX.—POLYPOID FIBROMA OF THE TONSIL.

FIG. CXC.—FIMBRIATED PAPILLOMA OF THE TONSIL.

often contain concentric 'pearls' and false nests. Their origin has already been described under chronic lacunar tonsillitis.

An **Angioma** as a primary growth of the tonsil is in present knowledge extremely rare, but is not unfrequently met with as a secondary change occurring in almost any other neoplasm.

Calcareous concretions are not infrequently developed in the crypts of the tonsils, whence they are extruded or require to be removed. They were until lately considered as due to degeneration of the arrested lacunar exudation; but it is now generally recognised that all tonsillar and pharyngeal concretions are of parasitic origin, the nucleus being mainly composed of leptothricial débris; and that the microscopic features and chemical reactions of the tonsillar concretions are identical with those observed in the incrustations of dental tartar. That the origin of these formations is parasitic is undoubtedly true,

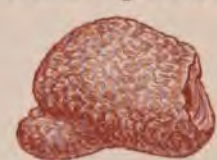


FIG. CXCI. — CALCAREOUS FORMATION EXTRUDED FROM THE TONSIL (EXACT SIZE).

but that they are also composed of broken-down epithelial matter, which becomes calcareous, cannot be denied. One such tonsillar specimen is delineated in Fig. CXCI. The concretions often have a coralline appearance from extension into the lacunal ramifications.

The SYMPTOMS to which these formations give rise are principally those of a foreign body, but they may induce or keep up considerable inflammation, and they also occasion great foulness of the breath.

TREATMENT consists in their removal, and the setting up of adhesive inflammation in the holes and crypts so emptied. Where the tonsil is at all enlarged, removal of a piece greatly favours permanency of cure.

MALIGNANT DISEASE OF THE FAUCIAL TONSIL.

(*Open out* PLATE V. *at end of the Book during perusal of this Section.*)

Writing my first edition twenty years ago, I made the statement that primary cancer of the tonsils was an extremely rare affection; and in that view I was supported by contemporary writers. This conclusion has been allowed to stand in succeeding editions; but since the study of laryngology has become more general, and individual experiences have become more systematically recorded, abundant evidence is available that the supposed rarity was probably not due to paucity of material.

I say, probably, because so careful an observer as Morell Mackenzie, in his *Manual* published in 1880, said that he had only seen seven cases in his large special practice of nearly twenty years' duration.

The **Hospital Statistics of Relative Frequency,** specially prepared for this volume, give 32 cases of malignancy of the tonsil in the last ten years, an average of nearly 1 per 1000 of all laryngeal and pharyngeal diseases combined; and of nearly 6 per 1000 of diseases of the fauces and pharynx.

Confirmatory of this modern view of increased frequency in the occurrence of primary cancer of the tonsil, may be mentioned the experience of Arslan and of Newman.

CLASSIFICATION.—Formerly I shared the general opinion, which was notably that of Morell Mackenzie, that the variety of cancer as it affects the tonsil was either scirrhus or encephaloid. It is true that in neither of the two cases which I early reported as scirrhus was the pathological nature of the growth distinguishable by its stony hardness; but this, as it appeared to me, only

illustrated the remark of Moore, that 'this character is far from being universal or pathognomonic' of that form of cancer in the throat. In two of the cases, however, the glands in the neighbourhood were characteristically indurated.

CASE XXXIX.—A housemaid, æt. 25, was under my care in hospital in December 1886, with such a condition of indurated glands; but the disease proved, on microscopical examination, to be undoubtedly a lympho-sarcoma.

In another case, however, that of Charles F. (No. XLVIII., p. 379), to be presently related, the cervical glands, though much enlarged, were by no means hardened, but, on the contrary, were so soft as to suggest fluid contents. Microscopic examination of portions of the tumour, which were removed on two separate occasions during life, gave undoubted evidence of its malignant nature, and this opinion was confirmed after death by the Committee of the Pathological Society, who pronounced it to be also a lympho-sarcoma.

Later experience, and the advancement of knowledge as to the varieties of cancer, have taught me that those cases which have been called soft scirrhus, if the anomaly of term be allowed, are all of them lympho-sarcomata.

In recent years, classification of neoplasms in this region, as in others, has become much more refined; for in older records no distinction was made between the different histological forms of carcinoma and sarcoma; these two great divisions of malignancy, so far as they related to the tonsil, were indeed altogether ignored. Now that microscopic processes are more elaborate and frequent, still finer distinctions may be drawn, to the advantage equally of the accuracy of historical records, of diagnosis, and of prognosis.

According to present knowledge, malignant growths of the tonsils may be classified as follows:—

A. EPITHELIOMATA.	B. SARCOMATA.
1. Squamous.	Round-Cell.
2. Alveolar.	Spindle-Cell.
3. Columnar.	Lympho-Sarcomata.
	Angio-Sarcomata.

The round-cell sarcomata are by far the most common of all forms of malignancy, an experience with which the records of Arslan are again found to coincide; next in order of frequency are squamous epitheliomata and lympho-sarcomata; whilst alveolar and columnar epitheliomata, spindle-cell and angio-sarcomata are represented in my case-books by a single example of each.

So far as I have observed, epithelioma of the tonsil always occurs as a primary formation. Some authorities, however, notably Mandl, say that cancer of the tonsil may be secondary. This it never is in the ordinary acceptation of the term, though

the tonsil may be attacked by either the sarcomatous or epithelial variety, by *contiguity*, in other words, by invasion of the disease from the tongue or some part in its immediate vicinity. Of this I have seen not a few examples.

CASE XL. was that of a hospital patient under the joint care of Mr. Lloyd of Bloomsbury, and of my colleague, Dr. Llewellyn Thomas. The appearance is delineated in Fig. 43, PLATE V. The case is recorded in full in the twenty-ninth volume of the *Transactions of the Pathological Society of London*, before whom the patient when alive was exhibited by me. He died three days after his visit to the Society, of hæmorrhage, the second in the course of the disease.

On the other hand, epithelioma may extend from the tongue to the tonsil, of which the following is an instance :—

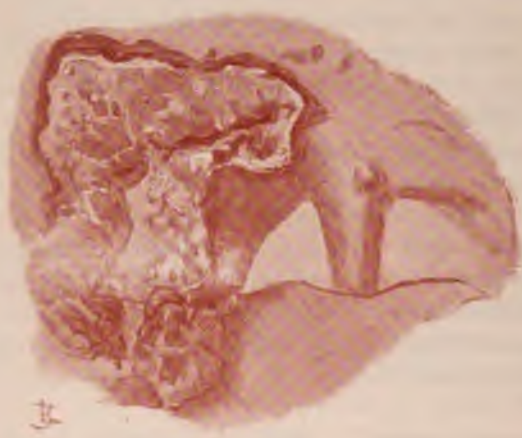


FIG. CXCII.—MALIGNANT EPITHELIOMA, EXTENDING FROM RIGHT TONSIL TO BASE OF TONGUE.

CASE XLI.—J. B., æt. 58, a stone-mason, applied at hospital, 13th December 1897. At that time a large malignant ulcer, which on microscopic examination proved to be of the nature of a squamous epithelioma, occupied the site of the tonsil and faucial pillars, extending also across the soft palate. The veins at the root of the tongue were very prominent and turgid, but the tongue itself was intact. Shortly afterwards the tongue was invaded, as seen in the accompanying picture (Fig. CXCII.). The patient died of cachexic asthenia, probably accelerated, as suggested by his family attendant, Dr. Charles Green, by some degree of toxæmia from the foul ulcerated surface of the growth. As a point of etiological interest, it may be mentioned that in addition to the irritating nature of his occupation, the patient had been infected with syphilis at the age of 18 years.

Malignant *epithelial* growths of the tonsil rarely occur by metastasis. The following constitutes a possible exception (unique in my practice) to this law :—

CASE XLII.—A woman, æt. 54, a patient at the Central Throat and Ear Hospital, died from epithelioma of the tonsil, of six months' duration, having had her breast removed for cancer six years previously. The metastatic evidence in this case is somewhat doubtful, considering the long interval of time that elapsed between the two affections.

With regard to *sarcomata*, especially the *lymphoid* variety, this rule does not hold good, since, in the many instances I have seen, some of which are here recorded, there has always been evidence of proximal or distant glandular deposits, previously to, or

simultaneously with, the appearance of the growth in the tonsil. As to the *spindle* form, several cases are recorded of coincidental multiple foci in the skin.

In the case of secondary infection, the *sarcomata* are frequently associated with visceral deposit, whilst *epitheliomata*, although infecting adjacent glands, are rarely seen in distant organs, such as lungs, liver, or other thoracic and abdominal viscera. Another point of distinction is that, while the sarcomata have a strong tendency to grow outwards, and to form a swelling under the integument, epitheliomata for the most part extend inwards, so as to diminish the isthmus of the fauces. In the earlier stages sarcomata are not infrequently encapsuled, thus appearing to grow in the substance of the tonsil; and until fungation or ulceration occurs, they may be easily mistaken for an innocent hypertrophy.

The **lymphatic glands** as a rule are not involved so early in sarcomata as in epitheliomata, but when once infected they enlarge more rapidly, are more widespread, and are softer, even before a breaking down of the primary growth. Exceptions have, however, been quoted. Ulceration is also undoubtedly earlier in epitheliomata, in this situation as in others.

ETIOLOGY.—As to **age**, although in other situations *sarcomata* are regarded as belonging to youth, yet in the tonsils no period of life seems free from them; the youngest case in my experience was 13 years, whilst the oldest is 89, and the majority ranged between 45 and 60. The law as to *epithelioma* that it is a disease of middle or advanced life, obtains also in relation to the tonsils.

With regard to **sex**, my own records show the proportion of 60 per cent. males and 40 per cent. females; epitheliomata more frequently attacking males, and sarcomata the females.

Whilst deprecating any attempt to solve the origin of cancer in general, it is not only justifiable but expedient to take heed of any etiological factor which may be peculiar or special to this region. First of these must be named the probable exciting cause of all malignancy, namely, **irritation**; and in this respect it is enough to recall the anatomical situation of the tonsils in the faucial isthmus, and the passive, yet prominent, rôle which they play during the act of deglutition of both saliva and food. Under this head must also be included the nature of occupation, such as that of a stone-mason, which contributed a probable factor in Case XLI. I have also seen an example of it in a distinguished personage who followed the profession of a sculptor. Three of my patients have been players of wind instruments, the clarionet, cornet, and trombone respectively. Next we must remember the

low resisting power of all tonsillar tissue, as evidenced by its readiness to every kind of infection.

The fact that **syphilis**, which has been generally recognised as the parent of cancer, irrespective of site, is apt to select the tonsil for its early manifestations, justifies an emphasis of its etiological influence in this region. Just alluding to the circumstance that to the devitalising influence of **alcohol** and **tobacco** may be added their special local irritating influence at the faucial isthmus, we may add a word or two as to **heredity**. On this point I can say definitely that, without offering an opinion on the general question, my experience has induced me to hold strong views in favour of a family predisposition to malignant disease of the tonsils, and to express a belief that it ranks equally, *mutatis mutandis*, with the generally accepted view of heredity in regard to all tonsillar inflammations.

FIG. CXCIII.—STRATIFIED EPITHELIOMA OF TONSILS (½ *in. Obj.*).

MORBID ANATOMY.—**Epithelioma** of the tonsil may appear in three forms, a division which is marked clinically as well as histologically. The *first* is that of the ordinary type of **stratified epithelioma**, and is characterised by activity of the surface epithelium, which rapidly invades the subjacent structures in the shape of cylindrical masses (Fig. CXCIII.). These fimbriated processes, when cut transversely, are seen to consist of a central core of concentrically grouped cell 'nests,' showing more or less 'horny' degeneration, often surrounded by a single layer of columnar cells, similar to those occurring in the deepest layer of the Malpighian stratum. In advance of the epithelial ingrowth, there is generally a zone of small-cell infiltration tissue, which varies considerably in amount. This variety tends to spread *deeply*.

The *second* form, whilst agreeing in detail with the first, is chiefly marked by a thickening of the surface epithelium, which spreads *superficially* rather than deeply. Nests are less numerous and relatively smaller, whilst the cylindrical processes are very short. There is a strong resemblance histologically to leucoplakia and psoriasis linguæ.

The *third* form differs entirely from the others, since there seems to be a tendency for the epithelial cells to invade the deeper structures individually, instead of collectively in the form of cylinders. Nests occur but rarely, and their absence may easily be misinterpreted. The epithelial elements at first lose their regularity at the surface, become swollen, and often vacuolated, the nuclei undergoing rapid mitotic changes. Soon, however, they separate, and, mixing with the small-cell infiltration tissue, they wander amongst the deeper structures.

These features are characteristic of early squamous epithelioma, associated with syphilis. In each variety 'cell inclusions' and 'fungi' are easily demonstrated.

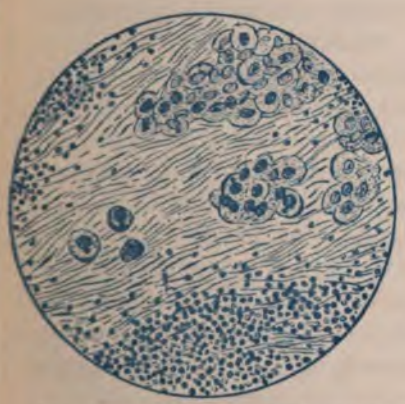


FIG. CXCIV.—EPITHELIOMA INFECTING LYMPH GLAND (⅙ *in. Obj.*).

FIG. CXCV.—EPITHELIOMA SHOWING CELL NESTS (⅙ *in. Obj.*).

The infection of a lymphatic gland by epithelial elements at an early stage is illustrated in Fig. CXCIV.; the cells are seen to be irregularly clustered in the stroma, along the track of the lymph and blood vessels. At a later stage these cells occasionally assume nest formation, as shown in Fig. CXCV.

Of the **alveolar** variety the details are those of an ordinary scirrhus, except that the stroma is less dense and the alveoli are somewhat larger than in breast cancer. The cells, which are loosely packed in the alveoli, are round and oval in shape, much larger than those of sarcomata, whilst their nuclei are oval, and, relatively to the protoplasm, are smaller.

In the single example of the **columnar** form which has come under my notice, the cells grew inwards in single and double layers, and were arranged as irregular cylindrical tubes, embedded in small-cell infiltration tissue; more deeply, their regularity was

lost in a tendency to form alveolar masses. In this, as well as in the true alveolar variety, there is no tendency to the formation of horny nests, but the columnar cells show cloudy and vacuolation changes.

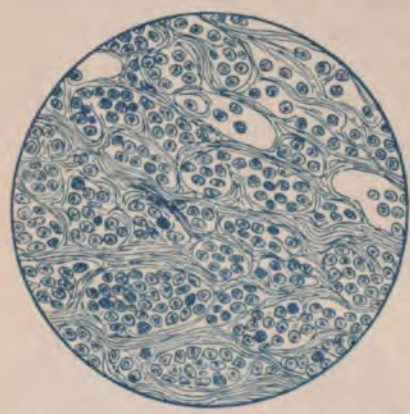


FIG. CXCVI.—ALVEOLAR EPITHELIOMA (⅛ *in. Obj.*).

Sarcomata of the tonsil are mostly of the small round-cell type, consisting of mesoblastic connective cells, embedded in a more or less prominent matrix or intercellular substance. The cells are similar to those in an ordinary lymphatic gland, but their round nuclei are larger, and present well-marked mitotic activity, whilst the protoplasm is relatively sparse. The intercellular substance is very scanty and difficult to demonstrate without the use of a differential stain, such as the triple Ehrlich-Biondi. It is generally of a granular character, rarely fibrillar, and contains thin-walled vascular channels.

The **lympho-sarcoma** (Fig. CXCVIII.) is a modification of the small round-cell variety, from which it differs in having a well-marked reticular stroma, arranged irregularly, and containing round cells in the meshes of the network. This stroma is easily

FIG. CXCVII.—LYMPHOMA (⅛ *in. Obj.*).

FIG. CXCVIII.—LYMPHO-SARCOMA (⅛ *in. Obj.*).

demonstrated by picro-carmine or the Biondi triple stain, especially after washing the section in some normal saline solution. The cells are similar to the ordinary lymphoid cells occurring in the

tonsils; in fact, it is at no time easy to differentiate the sarcoma from normal tonsil tissue. The chief points of difference will be found in the fact that the reticulum is less regular, the nuclei stain less deeply, the mitotic changes are more active, blood vessels are more numerous, and there is no evidence of characteristic lymph follicular arrangement.

The large-cell variety has not been seen in the tonsil, whilst the **spindle-cell** form has been recorded but once. There seems to be only an imperfectly defined granular matrix, which binds closely-packed fusiform-shaped cells whose nuclei are oval. These cells are often arranged in bundles, which interlace and follow the distribution of the arteries.

Angio-sarcoma is simply a modification of the other forms of sarcoma, by the presence of numerous blood vessels developed in the matrix. The walls are so thin, that, in addition to considerable distension or cavernation, they frequently yield to internal pressure, and extensive extravasations of blood result.

SYMPTOMS.—In some instances there is, especially in the early stages, but little apparent enlargement of the tonsil itself, since infiltration of the surrounding tissues, which often occurs as a very early symptom, obscures any definition of the tumour. So much is this the case, that, prior to ulceration, a correct diagnosis is generally arrived at rather from a careful consideration of the general and commemorative signs than of the subjective symptoms, or from the physical examination of the gland itself.

Thus all functional symptoms, as well as all physical signs, will bear a strong analogy to those of any inflammatory tonsillar affection. **Voice** will be thick, **articulation** impeded, **respiration** obstructed, **deglutition** painful, and the special senses of **smell** and **taste** impaired. Physically there will be redness, thickening with displacement, possibly ulceration and disorder of secretion. Examining more closely, we shall find that the **pain** of malignant disease is much more severe than in any benign inflammation of a chronic character. It is, in point of fact, very like the pain of a quinsy, except that it lasts for months, instead of for four or five days; it is only second in intensity to that which sometimes accompanies tuberculous ulceration in the same region. Pain in the ears, so characteristic also of similar disease in the larynx, is a distinctive symptom, and deafness and tinnitus are frequent coincidents.

PHYSICAL SIGNS.—**The colour** of a *sarcoma* is generally of a dusky red, with **infiltration** extending far beyond the ordinary bounds of inflammation, and with patches of ulceration or granulations (Fig. 49, PLATE V.); when, as in most cases, the patient

is markedly anæmic, the new growth may partake of the general pallor; the contour of an *epithelioma* is warty and of far paler tint, portions being sometimes almost white (Figs. 43, 44, PLATE V.). These differences are fairly well rendered in the coloured illustrations. In either form there may be **secretion**, thin and sanious, not thick and cheesy, as in lacunar inflammations of benign character; later it will be very offensive. It will require to be constantly cleared from the mouth, and will also be discharged freely from the nostrils.

The general health speedily suffers, nutrition is impaired, and the patient steadily loses weight. This loss of weight is regarded in my practice as a distinctive feature of the first importance. In the case of Charles F. (No. XLVIII., p. 379) the patient lost 26 lb. in ninety-eight days, and in the last fortnight of his life he emaciated at the rate of 2 lb. per diem.

In a case (XLIII.) brought to me by Dr. White of Retford, an opinion had been repeatedly expressed by another specialist, that the case was one of syphilis. The patient had lost a stone in weight in the three months previous to seeing me, the effect, as he was assured, of iodide of potassium; when I saw him he weighed over 16 st., and the patient had been rather congratulated on his loss. In twenty days, which elapsed before his next visit, he lost 6½ lb., and this sign enabled us to definitely confirm the doubts we had felt as to the correctness of the syphilitic diagnosis of the malady.

In a yet more recent example (CASE XLIV.), that of a trombone player, æt. 37, afflicted with small-cell sarcoma of the right tonsil, there had been a loss of weight of 25 lb. in twenty-five weeks. In the seven days following his first visit to me, when a fragment was removed for diagnostic purposes, the loss was rather over 3 lb.

Examination of the blood in the subjects of sarcomatous—and especially of lympho-sarcomatous—growths will generally demonstrate increase of leucocytes, with variability in staining reaction, the eosinophile group of cells predominating.

DIAGNOSIS.—It is often said that the error of mistaking cancer of the tonsil for syphilis is a very pardonable one, as the marks of difference between the two diseases are by no means distinct. Indeed, this was once said by the President for the time being of the Pathological Society, on the occasion of my exhibiting a case of cancer. I ventured to dissent from that view, and stated that, though the patient's own account may not by any means exclude the possibility of a co-existent syphilitic dyscrasia, the method in which the two diseases affect the tonsil (or, indeed, any other part of the throat) is wholly distinct. To more particularly emphasise these differences, I have contrasted the chief features of the two diseases in opposing columns:

SYPHILIS.	CANCER.
Functional Symptoms. — Swallowing sometimes difficult, but never impossible, though occasionally leading to return of	*Functional Symptoms.*—Dysphagia, as it is the first, is also the prominent symptom, and increases in severity so as

fluids through the nostrils; the sensation is essentially one of discomfort rather than pain, with entire absence of pain when the parts are at rest.

Physical Signs.—the tonsils are generally affected by syphilis in its earlier (secondary) stages by deposits on their surface of mucous patches; in the advanced stages (tertiary) syphilis attacks the gland as a perforating ulcer. There is but slight sympathetic glandular enlargement, which is not painful, and subsides with the cause of irritation.

Hæmorrhages are rare.

Loss of flesh, if existing, is slight, and only in proportion to diminished nutriment taken.

Therapeutic.—Most amenable to appropriate treatment.

to lead to total inability to take food. Acute lancinating pain is a prominent and almost constant symptom.

Physical Signs.—Cancer, whatever the form, is always manifested in the tonsils as a new growth, which may attain considerable size before the occurrence of ulceration. There is considerable infiltration and induration of neighbouring glands, which become as painful as the primary seat of disease.

Hæmorrhages are frequent and profuse, and are often the immediate cause of death.

Rapid emaciation commences long before dysphagia is by any means extreme, and advances even with relief of symptoms.

Therapeutic.—Advances in spite of every measure, medicinal or surgical.

There is but little likelihood of cancer of the tonsil being mistaken for any other disease than syphilis, except for a very brief period, wherever a microscopical examination can be obtained. Its points of differentiation from benign inflammations have been considered when speaking of simple chronic hypertrophy.

The following case illustrates the difficulty of diagnosis between cancer and syphilis in this region when the former is implanted on the latter:—

CASE XLV.—Mr. A., æt. 61, consulted me on 25th November 1895, by the advice of Dr. Ashmore Clarke. The patient was dreadfully crippled both in his upper and lower limbs, the result, as he stated, of confinement to bed for thirteen months, following on typhoid fever, after shipwreck, at the age of eighteen years. He admitted also to primary syphilis, at the age of twenty-eight. The special reason for visiting me was a difficulty in swallowing of both solids and fluids, which had existed for four or five months. The whole of the palatal arch was ulcerated and partially destroyed: the invaded surface was neither nodulated nor warty, but was covered with a layer resembling, both in structure and opalescent tint, a secondary mucous patch. There was a deeper ulcer on the right side of the posterior pharyngeal wall, and the surrounding mucous membrane, especially on that side of the fauces, was of a vivid scarlet tint (Fig. CXCIX.). Some general but not very hard infiltration of the neck was suggestive of malignancy, but the history of syphilis was so clear that it was determined to put him through a course of mercury. This was given in the first place in the form of biniodide, and later he went through a course of mercurial inunction. The effect of this treatment was quite marvellous on the contractions of the hands, arms, legs, and feet, and there was even slight improvement in

FIG. CXCIX.—EPITHELIOMA OF FAUCES IMPLANTED ON SYPHILIS.

the throat. This last was, however, only temporary, and on the final occasion on which I saw the patient, about six weeks from his first visit, the act of swallowing was accompanied by such pain, that no solid food had been attempted for the previous ten days. At this period a portion of the growth was removed for the purpose of microscopical examination, which showed that the case was one of stratified epithelioma. Death occurred about eight months from the date of my first seeing him.

My colleague, Wyatt Wingrave, recently reported an example at the Laryngological Association—

CASE XLVI.—The patient, æt. 40, had suffered twelve months previously from tertiary ulceration of the right tonsil, the primary infection dating from six years earlier. Both microscopic and therapeutic evidence confirmed the diagnosis, and the ulcer healed. Then six months after his first visit a true epithelioma developed.

The following typical cases of epithelioma and lympho-sarcoma, to be found also, the first in the thirtieth, the second in the twenty-ninth volume of the *Pathological Transactions*, contain some interesting clinical points, and are therefore given with detail:—

CASE XLVII. EPITHELIOMA.—This case was brought forward as a living specimen at the Pathological Society, December 3, 1879, and is recorded in vol. xxx. of the *Transactions*. The patient was an engine-driver of temperate habits, who, until within the last year, had enjoyed good health, with the exception of temporary sore throat on the same side as now affected seven years previously. He had been treated at various hospitals, chiefly, as it appeared, for syphilis, and he applied at the Central Throat and Ear Hospital on November 21st. The following were the principal points in his condition: He was pale and evidently emaciated, weighing 110½ lb. as against 126 lb. six months previously. His general health and appetite were poor; his pulse 92. Both voice and articulation were slightly nasal: his left nostril was obstructed, but there was no impediment in oral breathing, nor in the mobility of the tongue. His breath was very fœtid. He stated that swallowing of solids had become impossible, and that he lived principally on bread and milk and soup. His sense of taste had become impaired. He complained of shooting pain starting below the ear as soon as he got warm in bed, with considerable pain in taking food if he attempted to swallow it at all hot. His family history was good. He denied having had syphilis.

FIG. CC.—PRIMARY EPITHELIOMA OF THE TONSIL.
(SEE ALSO FIG. 44, PLATE V.)

On examining the mouth, it was seen that the left half of the soft palate and corresponding tonsil and faucial pillar were occupied by an almost white, but, in parts, slightly pink, fungating growth, extending from the left side of the tongue and for a considerable distance down into the pharynx. The uvula, as will be seen by reference to the drawing (Fig. CC.), and to the coloured illustration (Fig. 44, PLATE V.), was much pushed

to the right of the mesial line, being on a perpendicular level with the second right bicuspid. The new growth was closely connected with the lower jaw, and the tissue of the soft palate around it was red and swollen, but not indurated. Beneath the left angle of the lower jaw was felt a hard fixed lump (glandular), extending to the top of the hyoid bone.

A portion of the growth was removed by means of the galvano-cautery loop, and submitted to microscopic examination, which showed it to be composed of abundant proliferation of epithelial cells with but scanty-celled stroma. The patient remained under treatment for ten months: large pieces of the growth were removed by the galvano-caustic loop or by ordinary wire-écraseur almost each week, at the express desire of the patient, who experienced great relief thereby in both his breathing and swallowing. Nevertheless the disease progressed, and finally involved the base of the tongue, epiglottis, and angle of the jaw. He kept at work till three months before his death, which took place fifteen months after his first visit to the hospital. He died at his own home, and an autopsy was not obtainable.

CASE XLVIII. LYMPHO-SARCOMA.—Charles F., æt. 53, a carpet-beater and layer, first came under observation at the Central London Throat and Ear Hospital on September 17, 1877, complaining of throat trouble, and giving the following history:—

Had long been subject to catarrhal attacks in the throat, during one of which four years previously the voice had been temporarily lost. Had never suffered from any injury to the throat, nor had the tonsils ever been subjected to operation. With the exception of a gouty tendency, his family history was good, there being no evidence of any relative having suffered from a tumour, simple or malignant.

The present affection was considered to have commenced in the preceding May, when he first experienced a soreness of the throat, which had continuously increased; and had been followed a month later by difficulty in swallowing. These symptoms had recently been much aggravated. The pain was constant; was of a lancinating character, and extended from the fauces to the ears. The dysphagia had been succeeded by difficulty in nasal respiration, especially through the right nostril, from which there was a constant viscid and fœtid discharge.

Eight weeks previously, the glands on the right side of the jaw had become swollen and painful. He was conscious of having lost flesh for some months.

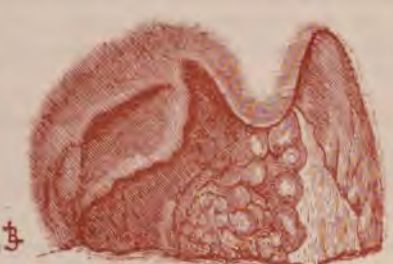


FIG. CCI.—LYMPHO-SARCOMA OF THE TONSIL.

(SEE ALSO FIG. 42, PLATE IV.)

On examining the interior of the mouth (Fig. CCI., and also Fig. 42, PLATE V.), the mucous membrane of the whole of the soft and hard palate on the right side was seen to be uniformly and intensely congested. The right tonsil was considerably enlarged, but no fluctuation was to be discovered at any point. The soft palate and uvula were pushed towards the left side. Behind the right posterior faucial arch, and apparently continuous with the enlarged right tonsil, projected an irregular fleshy mass, reaching nearly to the middle line, extending below the level of the tongue, and obscuring the view of the pharynx; it was of a deep red colour, firm in consistence, and when first seen was free from ulceration. There were no fungating masses, and there was no tendency to hæmorrhage.

Externally there was a well-defined lobulated and firm swelling behind the ascending ramus of the lower jaw, extending posteriorly as far as a line at fall from the back of the ear, and below as far as the level of the jaw. The skin was freely movable over the swelling, and was somewhat congested. The whole mass appeared movable on the subjacent parts. The sterno-cleido-mastoid muscle was highly projected at the upper

attachment. There was no pulsation, inherent or transmitted. The glands in the neighbourhood of the parotid were not enlarged, and no pain was caused by movement of the jaw. Weight of the patient at first visit was 12 stone.

On October 12, a month after his first application, the patient's condition was reported as having steadily deteriorated; his expression was worn, and his countenance was very anæmic, though he had lost no blood from the mouth, nor had he suffered from any other hæmorrhage. He experienced great pain in swallowing, and at other times, so that he was quite unable to masticate; his breathing also was more obstructed. The growth had become more prominent in the fauces; there was much saliva secreted, and there was very marked and characteristic fœtor of the breath. An irritative cough gave him much trouble, and his rest was greatly disturbed thereby. His weight had decreased 4 lb.

A piece of the growth was removed by means of the galvano-cautery loop with but little pain, and with very trifling hæmorrhage. The piece removed weighed about 3 drachms, was of a greyish yellow colour, mottled, with purplish spots. At one point it showed commencing ulceration. The mass was slightly lobulated, and was freely supplied with blood vessels. The central part was of dark apple-jelly colour, semi-transparent, and elastic in consistence. Microscopic examination confirmed the diagnosis as to the malignancy of the growth, which was thought to be encephaloid in character.

Twelve days later (October 24) the patient expressed himself as much relieved; swallowing was attended with less pain, and breathing was easier. His weight showed a decrease of 2½ lb. since the last date.

On November 1, another piece of the growth was removed, having much the same character, but more ulcerated. The operation was again followed by considerable relief. Deglutition was easier, the lancinating pains were seldom experienced, but the patient complained of a dull heavy pain over the right ear and side of the head.

He visited the hospital on December 23, walking both to and from his house, the distance of both journeys being fully two miles. His weight was 10 st. 2 lb., showing a decrease of 26 lb. in ninety-eight days. He had lost 7 lb. in the last fourteen days.

On the evening of the 24th (that is, on the day after his last visit to the hospital) a sudden attack of hæmorrhage took place, and death was reported as having ensued in less than a minute.

Autopsy made Sixty-three Hours after Death by Mr. G. R. Steil.—The larynx and pharynx with the tongue and the cervical swelling were removed entire.

The cervical tumour was marked by a shallow groove running downwards and outwards, and dividing it into a posterior upper and an anterior lower and larger part. Above the mass, lying in front of the internal jugular vein and against the pharyngeal wall, was seen the spinal accessory nerve, which, passing beneath the upper part of the tumour, emerged at the groove. The posterior division of the mass was firmly attached at the upper part of the base of the skull and the transverse processes of the upper two vertebræ; in front of it was the styloid process of the temporal bone. The anterior and larger division, ovoid in shape, was partly covered by the sterno-cleido-mastoid muscle. Above it lay the posterior belly of the digastric and the stylo-hyoid muscles; below it was free, whilst in front it merged into the thickened and infiltrated pharynx. The tumour was of a smooth, slightly lobulated surface, of a pinkish yellow colour, and semi-elastic to sense of touch, giving the idea that it contained fluid. On section it was at first firm, but the centre part was softer. It was of a yellowish grey colour, mottled with pink. On pressure there was characteristic juicy exudation. There were a few enlarged and indurated glands in the neighbourhood.

The common carotid artery, with the internal jugular vein and accompanying nerves, were pressed back and lay beneath the tumour; the external carotid was seen to emerge from behind it at its upper border. Anteriorly it was pierced by the superior laryngeal and the lingual arteries.

The whole of the soft palate and the upper walls of the pharynx were thickened and infiltrated. The tonsillar mass, which originally projected from behind the posterior

arch of the palate, had become greatly reduced by sloughing, which had also attacked the right pharyngeal wall. Several vessels were seen to be dissected by the ulceration in the wall of the pharynx, but even on most careful examination no arterial branch, tonsillar or pharyngeal, was traceable from the facial to the ulcerating and sloughing parts; so that it was impossible to say exactly whence the hæmorrhage had proceeded. The larynx was healthy, and the tongue also was uninvaded. No other organs were permitted to be examined.

Report of the Committee on Morbid Growths.—The parts forwarded to us consisted of a piece hardened in chromic acid, some pieces of diseased gland in glycerine, and the tongue, larynx, and adjacent parts in spirit.

The latter parts are the seat of a large soft growth, which, springing from the right side in the neighbourhood of the tonsil, infiltrates and thickens the posterior wall of the pharynx and the soft palate. The posterior walls of the pharynx and the tonsillar region show a ragged and sloughy surface.

Under the microscope all these parts have a very similar structure. The stroma forms a delicate reticulum, enclosing small cells with single nucleus, and occasionally much larger cells also with single nucleus. In the tonsillar region, the cells, though small, are decidedly angular; in the glandular mass outside it they are mostly circular. This difference in the shape of the cells appears to be a local accident, due rather to mutual compression than to any essentially different type of growth in the two parts, and we consider the disease to be a lympho-sarcoma. The nature of the growth, and the absence of any tonsil structure, make it probable that the latter may have been the original seat of the disease.

PROGNOSIS, it need scarcely be said, is most unfavourable, although the progress of the disease may be very slow, and the patient may experience considerable, albeit temporary relief on occurrence of ulceration or hæmorrhages. With advance of the malady the sufferer becomes painfully depressed, and at an early stage presents the well-known signs of the cancerous cachexia.

The **duration** of the disease varies considerably with the nature of the neoplasm. The longest survival occurs in those suffering with lympho-sarcomata, the extension of life varying from eighteen months to several years; the small round-cell sarcomata endure from six months to two years, and the same may be said of the epitheliomata. The last-named variety, however, especially the nested and excavating form, is by far the most malignant, the average duration of life after first recognition being about fourteen months.

Of the **causes of death,** asthenia is first responsible; whilst hæmorrhage, from the growth itself, follows next in order of frequency.

Death occasionally occurs suddenly, and is in that case generally due to hæmorrhage or to secondary œdema of the larynx. An instance of this latter kind occurred in 1877 at the Central Throat and Ear Hospital, in relation to a cancer of the lingual tonsil, to be described in the next chapter (Case LX.).

In one private case (XLIX.), that of a gentleman, æt. 42, who came under my care in May 1892, Mr. Pepper removed the growth by external incision, the carotid being tied, but death occurred on the third day from secondary hæmorrhage.

CASE L.—In another of a somewhat typical epithelioma, with features pointing to a lympho-sarcoma, which was reported in the forty-seventh volume of the *Transactions of the Pathological Society*, great reduction of the tumour, alleviation of symptoms, and prolongation of life (two years and four months from the time he was first seen) were obtained after injections of Coley's fluid, and I should certainly employ that remedy in sarcomatous cases, other circumstances being favourable.

Other modes of death are by gradually progressive systematic cachexia and by inanition.

TREATMENT.—Temporary and even considerable relief may be given by the removal of portions of the tumour by means of the ecraseur or galvano-cautery; but there are no means of eradicating the disease, or even of otherwise arresting its slow and certain march to a fatal issue however early or apparently complete surgical attempts at eradication are pursued, and this can easily be appreciated if one considers the close lymphatic anastomosis of this region, as illustrated in PLATE XV. Recorded experience of the operation of resection of a portion of the jaw in the hands of other surgeons has not yet induced me to recommend, much less to perform it. Injections of pyoktanin have been much vaunted, but have not been of service in any cases under my notice. Allusion has been made to the use of Coley's fluid—a preparation of the toxins of *S. erysipelatosus* and *B. prodigiosus* In the only case in which I tried it—one of sarcoma—the result was such as to justify me in advising an extended trial of it in this class of growth. As **palliatives,** the local application of chloride of zinc, iodine, iodoform, or iodol (Form. 65, 66, 61, and 62), may be recommended, with external pigments of chloral (Form. 53) or of belladonna in ointment or liniment. The painting of a 5 or 10 per cent. solution of cocaine or eucaine over the diseased surface, and injections of the same or of morphine hypodermically, are also recommended. The benefit of this last remedy is, however, somewhat discounted by its tendency to increase salivation; and in such circumstances a spray, wash, or lozenge of menthol may be usefully substituted. Sedatives—opium and belladonna —applied to the external auditory meatus will in some instances relieve the distressing earache; and the smoking of opium, 1 grain of the powder in each pipeful of tobacco, constitutes a really valuable anodyne. Feeding by enemata will often become necessary in the last days of life.

CHAPTER XVI

DISEASES OF THE LINGUAL TONSIL

(*Open out* PLATE VI. *at end of the Book during perusal of this Chapter.*)

HISTORY.—No mention is made of the lingual tonsil by Hippocrates or other ancient author, and the first to draw attention to it was the great Vesalius (1543); but his description is a rather vague one. Much more light is thrown on the subject by Wharton, who, writing in 1685, says that 'these glands (the tonsils) although they are believed to be a pair, are nevertheless, in point of fact, continuous with each other. . . . They are connected only by a thin and broad expansion of the same glandular substance, the grosser parts only being called the tonsils.'

Schäffenberg (1704) speaks still more emphatically, saying: 'There are indeed many people, both of the ancients and others, who hold that the tonsils are two separate glands; but more accurate anatomical observations have shown that the tonsils are a single mass of glandular flesh, carried across the fauces uninterruptedly.' Morgagni, writing in 1765, took the same view. It was reserved for Kölliker to accurately describe, in the year 1852, the anatomy, gross and minute, of the tonsils, with sufficient exactness to be capable of explaining their physiological functions, and to indicate their pathological importance.

Kölliker's description of the lingual tonsil is very detailed, and is contained in his remarks on the follicular glands. Much that he said may, in the present state of our knowledge, be considered obsolete, but the fact is of historical interest.

These particular researches of Kölliker were received with the attention accorded to all his work; and his statements that the lingual tonsil is something more than an embryonic structure, and that it is identical with the larger faucial glands, were confirmed by Gauster in 1857, whose observations were made on ox tongues.

Later on, Bickel (*Virchow's Archiv*), in 1884, made the important observation that—'In childhood the pharyngeal tonsil is more developed than that of the tongue. Thus there is more frequent trouble with it in childhood; whilst the reverse is true of the lingual.'

Ostman also, in 1884, pointed out the variability of a number of the follicular glands in this region, stating that in some individuals he found only thirty-four, in others as many as one hundred and two, the average being sixty-six; and, according to the same observer, their size varied between $\frac{1}{2}$ to 6 mm.

Then, in 1892, my colleague, Mr. Wyatt Wingrave, stimulated by the embryological enthusiasm of Bland Sutton, examined the developmental origin of the tongue, and, by careful researches, came to the conclusion that the two portions of the tongue have different origins, and that from embryological data all that portion of the tongue which is anterior to the sulcus terminalis should be called 'oro-glossus,' and that part behind it 'pharyngo-glossus.' Simultaneously—even in the same month—Rosenberg published a paper in Germany, in which he uttered the same opinion, saying that 'it may seem absurd to speak only of the base of the tongue, and not to consider the whole organ. But though these two parts of the tongue are in immediate connection, the base differs completely from the anterior portion, anatomically, physiologically, and pathologically.'

Chronological mention of facts of clinical importance will be made more appropriately when treating of the particular diseased conditions to which they may refer.

The credit of having been the first to bring this subject in its clinical aspect under notice has been generally awarded to Betz (1879), but priority should really be given to G. Lewin in 1863, not 1865 as stated by Kronenberg, to whose interesting and complete monograph I owe much valuable information. Moreover, prior to Betz, cases were recorded by Stoerk (1874) and by Heymann (1877).

Lastly, it may be remarked that Kronenberg, speaking of my own communication at Milan in 1880, says: 'Certainly to Browne is due the merit of having decidedly demonstrated that the complication of symptoms which has been called *globus hystericus*, and which up to then had been considered the expression of a functional neurosis, are frequently due to real anatomical changes in this region, which had only been overlooked because examinations had been incomplete.'

GENERAL PATHOLOGY. — In considering diseases of the lingual, or, as it has come to be somewhat misleadingly called, the fourth tonsil, for there are a pair, it must be borne in mind that, although there is without doubt great similarity in the structures of the separate masses of lymphoid tissue which go to form the tonsillar ring, there are also certain points of distinction in the minute anatomy which have important bearing on their pathology. These facts are set forth in the histology of this region, at pages 44 to 53. As to the lingual tonsil, it may be taken—(1) That according to Bickel it does not become developed so early as the palatine and pharyngeal. (2) It certainly does not undergo atrophy so early, and the evidences of colloid degeneration in the pharyngeal tonsil point to that part being the first to shrink. (3) In the lingual tonsil are numerous mucous and albuminous glands not to be found in the other tonsils. (4) The lingual tonsil is intimately connected with the tissue of the lingualis—the essential muscle of the tongue, and indeed the bed on which it rests, differs essentially from that of the palatine tonsils and the pharyngeal. (5) The crypts in the lingual tonsil are many of them lined with columnar ciliated epithelium, a phenomenon not perhaps of much clinical interest, since it is of a purely vestigial nature; it is nevertheless peculiar to this particular tonsil. (6) Kölliker, Luschka, and Lewin have all drawn attention to the very superficial position of the veins at the base of the tongue, whilst Zuckerkandl and Foucher refer to satellite nerves which accompany the veins. The bearing these several points have on the various morbid processes in this region will be considered as they arise.

I. ACUTE AND SUBACUTE INFLAMMATION.

PATHOLOGY.—Inflammation of the lingual tonsil may be primary, but this is rare; it is more commonly secondary. In

order to understand this, it must be borne in mind that the four groups of tonsils—the pharyngeal, tubal, faucial, and lingual —are in very intimate connection, the tissue between them being very thin, so that they form a kind of triangle, which Goureau terms the *adenoid triangle*, or, according to Waldeyer, and preferably, the *lymphatic ring*; and we may accept it that in the faucial region there is a perpendicular ring of lymphatic tissue, the follicles of which are arranged in composite masses (the faucial tonsils), or in a more or less discrete and scattered manner (the lingual tonsil). Bickel describes the ring as starting at the *pharyngeal tonsil*, proceeding thence to the apertures of the Eustachian tube, where again is a more numerous congregation of follicular glands (*tubal tonsil*); then, descending and following the posterior margin of the velum palati and posterior palatine arch, we arrive at the *faucial tonsil*, each of which is more or less connected by a chain or mass at the base of the tongue (*lingual tonsil*). The ring is completed in a similar way from below upwards (Fig. 45, PLATE VI.).

It will be readily understood that, if one part of the ring is affected, any other portion, which is in almost immediate contact, may suffer in like manner, though in varying degree. For this reason also the pathology of the inflamed lingual tonsil resembles very much the pathology of the inflamed faucial tonsil; and we consequently distinguish a *simple catarrh* of the lingual tonsil—a slight inflammation, which attacks only the mucous membrane.

Secondly, we have *lacunar inflammation*, which only attacks the crypts, and is characterised by the well-known yellowish white spots of blockage so commonly seen in the faucial region.

Thirdly, the inflammation may extend to the *parenchyma* and the surrounding tissue, constituting *acute lingual tonsillitis*, or even *peri-lingual tonsillitis*; suppuration occurring, it may be pustular, and limited to separate crypts; or these may coalesce to form a large superficial abscess. Should suppurative inflammation spread from the glands to the connective tissue, and to the intermuscular fibres, we are able to recognise a deep abscess, or true phlegmon. The actual pathogenesis of inflammation partakes of that of inflammation of the larger faucial tonsils, of which first is to be named *a primary microbic infection;* secondly, it may arise as a complication of one of the *infectious fevers*. For the anatomical reasons already given, there will be certain clinical differences, which can constitute points of diagnostic distinction.

Simple Catarrhal or **Lacunar Inflammations** — supposing they happen without affection of the faucial tonsils—are not

easily detected. An important sign, first mentioned by Simanowski, is that, on inspecting the fauces, we find all the parts in a normal state, except that the lower end of the anterior pillar, where it joins the root of the tongue, is reddish and swollen. There is another, namely, that in inflammation of the palatine tonsils there is a difficulty in opening the jaw; not so in inflammation of the lingual tonsil. The lacunar form was first described by Michelson, Fleischmann, and Ruault. When examined with the laryngoscope, the lingual tonsil will be seen swollen and inflamed, with yellowish white punctations, due to the blocking of all crypts by secretion. This, *microscopically* examined, consists of epithelium, pus corpuscles, and some or other of the many various micro-organisms of the buccal cavity. Sometimes only solitary follicles or a glosso-epiglottic fold are inflamed, sometimes the whole tonsil, and the process may extend forward as far as the circumvallate papillæ. In a few examples, pains, violent and constant, with paroxysms and cramps, are recorded, but where the inflammation is slight, the symptoms may be insignificant and intermittent. In all, complaint is made as of a foreign body which gives rise to constant attempts at ineffective swallowing, or may have the effect of actually impeding deglutition of food. The distress is generally referred to the root of the tongue, and may be localised externally by pressure over the hyoid bone. It is often one-sided, and a complaint is made of corresponding earache.

Fleischmann, who has reported sixteen cases, found eleven associated with pharyngitis, the ages of the patients varying from fourteen to forty-seven years; while, as to sex, seven were males and nine were females. In four cases the epiglottis was in contact with the lingual glands; in two the apex of the epiglottis was, as it were, embedded in the swelling.

The average **duration** of an attack is from two to three weeks.

TREATMENT is generally advised as consisting in the local application of mineral astringents; removal of the white masses which block the crypts by a curved spoon, with a subsequent application—preferably when the acute symptoms have subsided—of chromic acid or galvano-cautery. But the quickest relief is obtained by the application of a 50 per cent. mixture of guaiacol and almond oil (Form. 60). These procedures can only be pursued when the hand of the practitioner is guided by the laryngeal mirror.

Abscess of Lingual Tonsil.—It is interesting to notice that David Craigie, fifty years ago, described, under the name of *lingual quinsy*, an acute inflammation of the tonsil and base of the

tongue, apparently a very grave disease, for one of the patients whom he saw died, and three or four others, who were exceedingly ill, made but a slow recovery. It is probable that this affection was a severe modification of *cynanche tonsillaris*, in which the inflammatory swelling was not so strictly limited as usual to the faucial glands, but extended to those of the tongue and neighbouring parts, producing considerable swelling of the whole of the tongue. It is, however, not unknown for the lingual tonsil to be attacked in this manner primarily.

Simanowski recognises two forms; the first localised to the tonsil itself, and commencing as a lacunar inflammation which proceeds to suppuration. This is usually one-sided. The second or peri-tonsillar phlegmonous form attacks also, or mainly, the submucous tissue. It will be observed that these distinctions are analagous to those made in suppurating inflammations of the palatine tonsils. Ruault very correctly points out that the anatomical boundaries of the lingual tonsil are very definite, and extension therefore is rare.

The SYMPTOMS of abscess in this region are very marked. Pain is intense and constant, owing to the intimate connection of the gland with the lingualis muscle, and deglutition of even fluids is extremely distressful. The temperature may rise as high as 104° F. The lingual tumefaction may be so considerable as to constitute a mechanical obstruction to respiration, and so give rise to distressing dyspnœa; or this symptom may be caused by an œdematous swelling, either of the epiglottis or the glosso- and ary-epiglottic folds, or of all of them together. The inflammation may spread still further downwards and backwards, so that the larynx becomes affected or displaced to the right or left side; or, again, it may extend forwards so as to involve the intermuscular tissue in front of the circumvallate papillæ; and in this event the tongue may be enlarged to such an extent that it is protruded from the mouth for two or even more inches. Finally, the inflammation may spread to the floor of the mouth, and may then be easily mistaken for, or may indeed constitute, 'Angina Ludovici.' Thus we see that an inflammation of the lingual tonsil may be the real cause of some cases described as general or *phlegmonous glossitis*; and the exact nature of the case is extremely liable to be overlooked on account of the occasional difficulty, or even impossibility, of opening the mouth. Palpation, if effected, is painful and difficult, and does not always give satisfactory results; the parts of the tongue being nearly of equal softness, and fluctuation difficult of differentiation. The site of the pain may, however, be

localised by this means, and thus the diagnosis may be made more accurate or even absolute.

DURATION AND PROGNOSIS.—The *catarrhal* and *lacunar* forms run their course in from three to eight days, but cases which have lasted up to three weeks are on record. The prognosis is much more serious in the *phlegmonous* form, because in these cases the process extends to tissues in the neighbourhood; but, indeed, in any case it cannot be too often or emphatically insisted on, that, both in degree and vital danger, acute inflammations of the lingual tonsil are always more grave than those of the faucial. Happily they are much more rare. The density of the tissue on which the lingual tonsil rests, renders œdematous extension to the larynx beyond the epiglottis uncommon, but it is always possible; and the respiratory distress may then be so extreme as to threaten, or even to demand, tracheotomy. Beyond this, from the liability to a sudden bursting of the abscess, suffocation may happen at any moment. It is therefore not sufficient to diagnose tonsillitis or quinsy; wherever possible the laryngoscope should be employed, and the lingual tonsil ought to be carefully examined with the mirror; a digital exploration should also in no case be neglected. Omission to recognise the true condition, of which instances could be quoted, would explain most of the cases of death from 'quinsy,' a termination which is rare when the faucial tonsil only is attacked.

This brings us to TREATMENT.—Acute inflammations of the lingual tonsil being frequently secondary, constitutional and local remedies, suitable to a similar condition in the parts first attacked, are to be pursued, only with even more vigour. It will be advisable in all cases to take a culture of the secretion at a very early stage, and to direct the internal treatment on the indications thus obtained. Generally, it may be said that the measures, both general and topical, which have been advised for the relief of ordinary tonsillitis and tonsillar abscess, will be useful; of the former may be called to mind as valuable the salicylates and salol. In mild cases, local applications of guaiacol, either pure or diluted, with an equal quantity of almond oil, are sufficient; and even in the most severe this remedy gives marked relief. In the phlegmonous form, ice externally and internally is of additional utility. Alcoholic stimulants are indicated in the later stages even more urgently than in faucial tonsillitis, on account of the greater depression of the vital energies, due to the increased difficulty in respiration. It should never be forgotten that suppuration of the lingual tonsil is an affection which en-

dangers life. So soon, therefore, as the surgeon is satisfied that pus is formed, it should be liberated. This may be safely done by an incision with my tonsillar knife (Fig. CLXXII., p. 346), or a long curved bistoury, the opening being made just in front of the epiglottis and in the middle line, so as to avoid the lingual arteries. The abscess cavity should be well scraped out, and the mouth well syringed with antiseptic solutions. Gargling is useless, and only aggravates the discomfort and pain.

Chronic Inflammation of the Lingual Tonsil: Varix of the Lingual Tonsil.

In the subacute and chronic forms, quite a different chain of causes and symptoms from that observed in the acute is presented, but it merits equally attentive consideration.

Although Stoerk, Heymann, and Betz had already directed attention to enlargement of the lingual tonsil itself, notice was first drawn to chronic hypertrophy of the tissues in the base of the tongue, in conjunction with engorgement and even varix of the veins in that situation (it is, as will be seen presently, convenient to treat of the two together), as a cause of many obscure throat troubles, in a communication made by myself at the first International Laryngological Congress held at Milan in 1880; before the Philadelphia Medical Society in 1887; and again at the Birmingham Meeting of the British Medical Association in 1890, though in the earlier papers I made the mistake of speaking of enlargement of the circumvallate papillæ instead of the more or less discrete mass of lymphoid tissue now known as the *lingual tonsil*, which is, in fact, the site of the disorder.

The first communication was the result of the examination of a large number of cases made in 1878, in conjunction with my colleague, Dundas Grant, who was then registrar at the Central London Throat, Nose, and Ear Hospital, for the purpose of endeavouring to find objective causes for that group of subjective symptoms so commonly generalised as 'Globus hystericus.'

The following, in order of frequency, were reported as the principal objective conditions to be found:—

1. Fulness, and even varicosity of the veins at the base of the tongue, which, as Kölliker specially pointed out, is highly vascular. It is also to be noted that the veins are in this situation very superficial.

2. Hypertrophy of the lingual tonsil, a condition often associated with dyspepsia.

3. Slight enlargement, or at least congestion and sensitiveness on touch, of the thyroid gland. In many instances in which there is but slight enlargement of the gland, the peculiar thrill of active congestion will be felt on palpation of the thyroid region; and in many cases where there is no thyroid swelling whatever, one can, by quite mild external pressure on the gland, produce the sensation of globus, a symptom which, in my first paper, I ventured to call an 'opprobrium medicinæ,' for in the majority of cases—at any rate of those presented to the throat specialist—it has an actual anatomical basis, and is but rarely of a purely neurasthenic origin. It is not surprising that dilated lingual veins and thyroid congestion should co-exist, when we remember that any obstruction—whether pulmonary, cardiac, or thoracic—will obviously influence the circulation at both sites.

Since that time the correctness of my views has been confirmed by several independent observers, who were evidently unacquainted with them, as, for instance, Swain of Hamburg, who wrote of it in 1886; also by other quasi-original communications, some of which, however, have afforded further valuable information.

It is of historical interest to mention that my paper at Milan was corroborated by a quite independent contribution at the same congress—on Varix of the Throat—from the pen of my lamented colleague, Llewellyn Thomas, he treating not so much of varicose veins at the root of the tongue, as of those frequently seen on the posterior wall of the pharynx, and on the pillars of the fauces, associated with chronic tonsillitis and chronic glandular pharyngitis.

It is only candid to add that, while I have been credited with originality by some, I have been accused by others of unduly exaggerating the importance of lingual varix, my critics asserting that all the symptoms of trouble in this situation may be accounted for by hypertrophy of the lingual tonsil alone. This circumstance and a certain novelty in the subject prompt me to give it full presentment, and constitute the reasons for considering it with more detail than its clinical importance would otherwise merit.

ETIOLOGY: **1. Frequency.**—By an analysis of the total number of cases of disease of the throat and nose, and excluding those of the ear, presenting themselves at the Central London Throat, Nose, and Ear Hospital, in the five years 1891 to 1895 inclusive, 17,556 in number, 1866 cases are registered as having suffered from 'varicose veins, and hypertrophy of the lingual tonsil.' The figures represent a frequency of 10.6 per cent. It is somewhat unfortunate—although to a large extent unavoidable—that, as a sequence of my early observations, both con-

ditions have been recorded under one heading, and in any case it is difficult to separate the one from the other. These figures probably represent the proportion submitted to treatment, or at least noted in the diagnosis; for, however that may be, the somewhat fuller notes of my own private practice show a much greater frequency of this condition as a point worthy of record. I find, indeed, that in no less than 438 cases, note was taken of a varying degree of venous congestion and fulness, which I generically term lingual varix, in a total number of 1547 patients suffering from diseases of the throat and nose (again excluding the ear), treated within three years, 1893 to 1895 inclusive—a proportion of 28.3 per cent.

This varicose state was, of course, of very variable grade, and the term is used by me to signify any excess of venous engorgement, in degree varying from a more than normal prominence and fulness to absolute distension, tortuosity, and the presence of bead-like swellings, which I have likened to bunches of black currants. The condition was associated with relaxation of the uvula in 261 cases, or nearly 60 per cent. of the whole number. In not a few of these it was observed in patients who, having had an elongated uvula shortened, had not lost their symptoms, and in whom it is fair to assume, from the result of further treatment, that only a portion of the cause of their trouble had been removed by abscission of the relaxed tissue. In forty-nine cases, or 11 per cent., varix was associated with chronic pharyngitis, without relaxed uvula.

In 146 cases, otherwise 33 per cent. of all my private cases of varix of the base of the tongue, whatever the degree, there was hypertrophy of the lingual tonsil. This number, 146, represents a percentage of 9.4 on the whole 1547 private cases, a proportion which very closely agrees with the figures quoted by Swain, who records 190 observations of hypertrophy of the lingual tonsil, representing 8.7 per cent. of all the private cases of Professor Hagen, in whose hospital practice the proportion was 3.2 per cent. The criticism that this situation is not one favourable for varix seems very strange, when one notes how frequently there is an association of glandular hypertrophy, of which vascular dilatation is, so to speak, an ordinary and natural consequence. Subtracting the number of cases in which there was associated lingual tonsillar hypertrophy (146) and elongated uvula (261), we have a balance of 79, or 16 per cent. of this class of case, and 5 per cent. of all patients in my private practice for five years, in which varix at the base of the tongue was noted as a separate

fact; and this is one answer to those who doubt the importance of varix, unassociated with overgrowth of the lingual tonsil.

It is convenient to quote here from some of the authorities who are in agreement with me as to the importance of lingual varix—and foremost, both in chronology and eminence, must be named G. Lewin of Berlin. It is but recently I have found that this great pioneer of laryngology treated of the subject in his *Clinical Essays on Diseases of the Larynx*, published in 1863, which date marks so early a period as the fourth year of practical laryngoscopy. His remarks are quoted at length.

FIG. CCII.—VARIX OF THE BASE OF THE TONGUE (FACSIMILE AFTER LEWIN, 1863).

"*Pharyngitis varicosa.* This disease may cause bleeding. I may mention here the case of Dr. B. He suffered for many years from blood-stained sputum, with and without cough. He had consulted authorities of several universities. Finally he went to Geheimrat Frerichs, who suspected the real source of the hæmorrhage, and addressed the patient to me. I found, on examining him with the laryngoscope, an injection of the mucous membrane of the lower posterior wall of the pharynx; this place was occupied also by some small varicose veins, which went in the direction of the larynx and œsophagus. These varicose veins showed traces of recent bleeding.

"I may mention other cases, in men as well as in women, who seemed to be affected with general plethora, and who said the cause of their trouble was 'hidden hæmorrhoids' (*versteckte Hæmorrhoiden*). I found in the throat the following state: From the insertion of the epiglottis to the middle of the tongue, a number of injected, blue-reddish, elevated veins were seen, which crossed the circumvallate papillæ. Some veins were found near the margins of the tongue, giving off small branches, which terminated in small points, of enlarged veins, the size of a pinhead, the whole thing looking like 'grapes' (Fig. CCII.). A number of these patients suffered from blood-spitting.

"In some of these cases I saw in the fossa navicularis laryngis, parallel to the 'plica crico-pharyngea,' a bluish red vein, as thick as a crow-quill. All these persons were healthy, except that they suffered from abdominal and hepatic plethora and their throat troubles." These last, in 1865, Lewin more fully described as "sensations of scraping, burning, and dryness in the pharynx" (*Kratzen, Brennen, Trockenheit*).

Bosworth, of New York, writes in his classical *Treatise on Diseases of the Nose and Throat*, New York, 1892, vol. ii. p. 202—

'In this connection (hypertrophy of the lingual tonsil) mention should be made of the varicose condition of the veins at the base of the tongue, the symptoms of which, to a certain extent, resemble the enlargement of the lingual tonsil, as mentioned by Roe,

Lennox Browne, and Manon. An examination with the laryngeal mirror easily reveals the large blue veins crossing through the tissues at the base of the tongue. The indication for treatment of this affection is in the use of the actual or chemical cautery.'

Clarence Rice, *The Medical Record*, New York, vol. xxix., p. 49, 1886, writing on 'Unusual Causes of Coughing'—

'The papillæ at the base of the tongue were greatly hypertrophied, and the superficial lingual veins were much enlarged. They appeared like a number of earth-worms.'

John O. Roe, late President, American Laryngological Association, has treated of this matter in several communications: thus in the *Journal of the American Medical Association*, vol. xiii. p. 171, 1889, he says—

'The lingual tonsils are so situated as to be easily irritated by solids and fluids of different temperature and character. By these exposures to irritation the blood-vessels become congested, enlarged, and varicose. . . . The other measure of treatment is to destroy the varicose vessels. This is best accomplished with the galvano-cautery, by use of a fine point applied along the course of the vessels.'

Again, at p. 583 of the same Journal, where the article is printed at length, full credit is given me for pointing out that

beyond local discomfort, chronic engorgement of these vessels may be symptomatic of mitral insufficiency, or of severe hepatic derangement, or of even cerebral lesion, my Philadelphia article being quoted.

To these may be added the names of Manon of Bordeaux (1887), Seiss (1889), Clark (1890), Wroblenski (1892), Seifert (1893), Dabney of Louisville (Burnett's *System*, 1893), Hamilton of Adelaide, S. A. (1893), Bar of Nice (1897), and of several others whose opinions on various points of clinical interest are given in the other portions of this chapter.

2. **Sex.**—Of my private cases, 303 have been males and 135 females; the proportion being as 69 per cent. of males to 31 per cent. of females. These figures, although they include cases of both varix and lingual tonsillar hypertrophy, came to me rather as a surprise, for my impression had certainly been in agreement with the reports of most other observers—that this condition was more frequent in the female than in the male sex. Swain found that 90 per cent. of hypertrophy of the lingual tonsil belonged to females. Seiss says that this condition is most frequent in women, and Farlow's cases were all women. Moreover, Fleischmann, who has recorded sixteen cases of acute inflammation of the lingual tonsil, states that, as to sex, seven were males and nine females. On the other hand, Seifert thinks that the male sex is the most liable to be affected; and Bar of Nice, quoting this statement, says: 'Without doubt, because men are more

exposed to the exciting causes than women'; curiously adding that 'although our own statistics (nine females to one male) are contrary to the view, we do not hesitate to range our opinion in line with that of Seifert.' Escat, in an exhaustive monograph recently published, well says, that though the condition may be considered equally common in the two sexes, but the fact that the neuropathic reaction is more frequently emphasised in the female has led practitioners to accuse that sex as the most liable.

An explanation of some of these discrepancies is probably to be found in the nature of the occupation of the patient—a subject, as far as I am aware, hitherto untreated in this connection.

3. Occupation.—No less than ninety-nine of my private cases, representing a proportion of 22.5 per cent., were professional voice-users; and by far the majority of these were males, represented by singers (in whom the proportion of the sexes was about equal), clergymen, schoolmasters, stockbrokers, auctioneers, actors, barristers, and members of parliament; whereas, besides the vocalists, there were only a few school-board teachers and a few engaged in drapery shops among the females. This last-named occupation is equally frequent as a cause, by direct irritation of dust, etc., in both sexes; but there is another trade—that of a publican—which frequently predisposes, it may almost be said, excites to lingual varix. Birch-Hirschfield has particularly noted alcoholic indulgence as a cause, and would in this appear to agree with Lewin, Schmidt, and others, who attribute the trouble largely to constitutional derangement, of which hepatic disorders are prominent.

From a consideration of the social status of voice-users, it is quite possible that the relative frequency as to sex, in hospital practice, would be more in accordance with that of other observers, and could be explained by the larger proportion of women of the artisan classes who are predisposed to this disease by constitutional rather than by local causes.

4. Age.—It may first be premised that, as has been especially noted by Bickel, in childhood both the faucial and pharyngeal tonsils, being more developed than the lingual, hypertrophy in the former region is more frequently observed in patients of tender age; the reverse being the case in adult life. Those who do not admit this distinction may be referred to the anatomical differences which go to show that the vitality of the lingual tonsil persists for much longer than the pharyngeal and than even the palatine.

It is very rare in the infant. In vol. xx. of the *Transactions of the Pathological Society*, a highly instructive and illustrative case

is recorded by Hickman, of a child who died of asphyxia a few hours after birth, due to what was believed to be a tumour obstructing the glottis. On *post-mortem* examination, this proved to be simply an enormous hypertrophy of the normal tissue of the posterior portion of the tongue, the anterior part being unaffected. M'Bride has recorded a case in a child aged seven, in whom, however, the hypertrophy is said to have caused no trouble. Ruault also says it may occur in children. The youngest age at which I have seen lingual varix and tonsillar hypertrophy has been from eighteen to nineteen years, and such cases have all been observed in singers. Rushton Parker has removed an enlargement of the lingual tonsil of the size of a walnut in a girl aged 16½ years. The most frequent period is from twenty-five to forty-five years; after which date hypertrophy of the lingual tonsil is not so common. I have recently seen a case, however, in a patient æt. seventy-two; and another æt. fifty-eight; in both the condition was the cause of marked symptoms. Varix is comparatively frequent for several years longer in patients who are the subjects of chronic inflammation and relaxation of the pharynx and velum. This experience is confirmed by other authorities. Swain's youngest patient who suffered from hypertrophy of the lingual tonsil was sixteen, and the eldest fifty-seven; his average being thirty-three years. Farlow's cases averaged thirty years, and all those of Gleitsmann were between twenty and forty years.

PREDISPOSING CAUSES.—Most of the causes—predisposing and exciting—of lingual tonsillar hypertrophy and varix might be comprehended in those which excite to general pharyngitis, but there are several which may be said to be special to the condition; and seeing that in only 11 per cent. of my cases was there evidence of chronic pharyngitis, they merit detailed attention.

To further generalise, it may be said that the etiological factors in the production of overgrowth of the lymphoid tissue at the base of the tongue are in a few circumstances identical with those leading to enlargement of the other faucial and pharyngeal lymphoid glandular masses, namely, the contamination of the buccal fluids by micro-organisms and their irritating chemical products—the result of their life processes—in association with quasi-rheumatic and other symptoms. In corroboration of this statement, it may be mentioned that in septic and rheumatic anginæ, a complete blocking of the lacunæ at the base of the tongue may often be seen, representing a precisely similar condition to that which in the faucial tonsils is erroneously described in even modern text-books as 'follicular inflammation,' and still

more ignorantly as 'ulcerated sore throat.' On the other hand, I cannot recall a case of diphtheria attacking the lingual tonsil primarily, nor even secondarily, for as a rule the false membrane, when it extends towards the larynx, does so by creeping downwards along the faucial pillars to the epiglottis and ary-epiglottic folds. In scarlatina, again, the throat lesions more frequently spread from the base of the tongue to the palatine tonsils, than reversely.

Swain, while not insisting on the connection with infectious diseases, states that in many *post-mortem* examinations after typhoid and scarlet fever, measles, and diphtheria, hypertrophy of the lingual tonsil has been found; likewise in anthrax and tuberculosis. Birch-Hirschfeld speaks of the association of decayed teeth.

There is frequently a history of faucial tonsillitis, and it would appear that, whilst in children the upper or naso-pharyngeal portion of the 'lymphatic ring' is most frequently associated with the faucial inflammation, in the adult it is the lower or lingual. Bar draws attention to the fact that an enlargement of the lingual tonsil may take place somewhat suddenly without the occurrence of acute inflammation. He has observed it as a sequel of influenza; and I have seen several cases in which the same cause has been assigned for accentuation of previously slight symptoms, to the extent of demanding relief.

Ralph Seiss has found lingual tonsillitis to be very common in the over-worked and under-nourished; he has also observed it quite frequently as an expression of the gouty diathesis. I have seen such a case in the person of a lady, aged sixty-three; the marked benefit derived from small doses of colchicum tending to confirm the dyscrastic connection. Dmochowski believes in the frequent association of lingual tonsillar hypertrophy and tuberculosis. This opinion is shared by Wroblenski and by Schæffer and Heyman, each of whom has reported a case, that by Heyman being one of ulceration. I have seen more than one instance of lupus of the lingual tonsil. One, a lady aged thirty-eight, is at present (March 1898) under my care; while I am also treating a hospital patient, female, aged fifteen, who has large lupous patch on the posterior part of the pharyngo-glossal on the right side.

The chief factor, in my judgment, in the production lingual varix is a constitutional or acquired debility of the vaso-motor system. This is exhibited in a history of chilblains childhood, and cold feet and hands in later years. Still more confirmatory evidence is a tendency to varix in the lower limbs

t the door of a congenital or acquired nasal obstruction; it be simply recorded that 126 of my cases, or 28.7 per cent., the subjects of nasal stenosis; but, as would be inferred the ages, in the majority the cause of the obstruction was ed, being of the nature of hypertrophic rhinitis; in many ces it was associated with the presence of a septal spur.

hose who experience a difficulty in recognising the fre- y of lingual varix, might find the explanation of a large rtion by remembering that nasal stenosis always implies ent oxygenation of the blood—the red corpuscles are always the normal—and also sluggish venous return. But, in ion, the enforced open mouth furnishes another reason for cal engorgement.

he particular form of rhinitis leading to chronic linguo- litis and varix is less frequently of the sclerotic variety of the vascular, the posterior aspect of the inferior turbinal especially frequent. From this association it was agreed, nference with my colleague, Wyatt Wingrave, to call this of nasal hypertrophy, **turbinal varix**; and it was first so ninated in the fourth edition of this treatise, published in .

XCITING CAUSES have already been touched upon in what een said as to predisposing factors, and also in allusion to uestion of the occupation of the patient. But it is import- o insist on the large proportion of cases in those who make ssional use of the voice; which circumstance requires just qualification—that it is not so much the *use* of the voice as wrong method of producing it, constituting an *abuse*; in a ases also there may be *over-use* of the voice. In other s, by analogy, not so fanciful as may at first appear, the constitutes either a constipation of the vocal function, e the method is at fault, while an over-use may be termed a diarrhœa. The result in either case is a condition closely gous to that of hæmorrhoids, a term first given to lingual by Lewin in 1863.

ATHOLOGY.—The morbid anatomy of lingual varix and ic tonsillar hypertrophy is only what we might expect from tiology, and therefore requires no elaboration. The varix is bly due to obstruction of the vessels by pressure of the ged gland. In several of the figures in the coloured plate asonableness of this explanation is emphasised. In others, occurs without tonsillar hypertrophy, or even after the gland trophied.

I am indebted to Escat for the information that, according to Verneuil, 'superficial varices only make their appearance when the deep varices have acquired a certain development.' Escat also says: 'Many kinds of neuralgia, otherwise inexplicable, are to-day attributed to circulatory troubles in the satellite veins of the nerves, and to a consecutive neuritis.' Quénu has thus explained certain neuralgias: 'The trunk of the lingual nerve, evident seat of a glossodynia, is in effect, according to Foucher, accompanied by a satellite vein, and even by two, according to Zuckerkandl.' This anatomical fact is held by Escat to legitimise his hypothesis, and that of Piotrowski, that all neuroses in this situation may be attributed to varices, superficial and deep.

SYMPTOMS.—**Subjective or Functional.**—*Paræsthesia.*—The most important subjective symptom of chronic hypertrophy is no doubt that of an abnormal sensation in the pharynx. This may take the form of a foreign body situated deeply in the throat, or the rising of a lump (globus hystericus). Swain, and also Reintjes, believe in this condition as causative of globus. Ruault does not. Swain has also noted the association of varix, but less frequently than I. Some patients describe the foreign body as a hair, some a pea, some a vesicle at the back of the tongue, others a brush which moves up and down, others a straw. Frequently the sensation is expressed as that of a weight or of a suffocating constriction, but quite as often the subjective sensation is limited to a feeling of burning and heat, or, as occurred in one of my patients—an otherwise strong, hale farmer—of a feeling of intense cold, with exacerbation on swallowing and after food-taking. As an effort to be rid of these disagreeable sensations, characteristic cramp-like contractions, and attempts at swallowing even when not eating, constitute a veritable faucial or pharyngeal *tenesmus*, a term which is now accepted by many observers.

In the majority of cases, all symptoms disappear during meals. I have met but one case where the opposite experience was recorded; but in any case they set in quickly afterwards, putting the patients to gross inconvenience and distress, and inspiring them with fears, that are happily without foundation, of graver maladies—cancer, tuberculosis, or ulceration at the back of the tongue — the last subject treated of interestingly by Lefferts, Verneuil, and Poyet.

With regard to this imaginary ulcer and phantom cancer of the tongue, it may be noted that a favourite spot is the roughened patch (*fimbria linguæ*) situated at the side of the tongue just in front of the anterior faucial pillar, and corresponding morphologically to the *papillæ foliatæ* of the rabbit.

Pains of a pricking character, and more or less constant, are as a rule present; they are located in the part lateral to the hyoid bones, about the region of the great cornua (Villecourt and Seifert). Hagen and Ruault observed pains between the scapulæ, and in the anterior and lateral parts of the neck,—a situation, especially that of the shoulder-blades, noted in several of my own patients.

CASE LIII.—A lady, æt. 46, sent to me so recently as January 1898, by Dr. Goodworth of Doncaster, referred her trouble to a pain rising and falling, from a point which corresponded with the sternal notch. It was only after the relief obtained by cauterisation of the varicose veins that she could be persuaded that her symptoms were not due to a malignant tumour.

Torticollis has been reported as a symptom of enlargement of the pharyngeal tonsil (adenoids), and I have recently seen—

A case (LIV.) in which the success of treatment proved that a congery of varicose veins on the right lingual tonsil was responsible for spasmodic muscular contraction of the sterno-cleido-mastoid of the same side. I had an opportunity of showing the patient, a lady, æt. 62, to Dr. Sansom.

In another case (LV.), also recent, the patient, a female, married, and æt. 46, presented herself with torticollis and constant pain in the occiput. There was evidence of typical lingual varix, and the patient likewise suffered from rectal piles and varicose veins in the leg, in both of which regions cramps were prominent symptoms.

In a few cases in which the epiglottis is imprisoned, as Cohen has termed it, occasional difficulty in swallowing (*dysphagia*) may be experienced, but rarely pain (*odynphagia*).

So early as in my first communication at Milan, I pointed out how characteristic are the vocal symptoms of singers affected with hypertrophy of the lingual tonsil. The usual complaint is that the voice is uncertain, of an inability to sing high notes, of being easily tired, and of a peculiar hoarseness, which only lasts a few hours, to pass off with rest, but to recur after the next singing exercise.

It is not unimportant to once more insist that this huskiness in the speaking and failure of the **singing voice**, while a result of the actual morbid condition, almost invariably originates in a fault or abuse of functional exercise. Holbrook Curtis of New York, Simanowski of Petersburg, and Escat of Toulouse, confirm the injurious effect of lingual tonsillar hypertrophy on the voice, but none of them appears to recognise the causal relation between the functional abuse and the tissue overgrowth.

I mentioned also at Milan the frequent presence of **cough** and **hemming**, and since then French writers—Boulenger and Manon, for example—have related cases of simple hypertrophy of the lingual tonsil, in which an irritating and obstinate cough was the

principal subjective symptom. It is unproductive, and of the brassy, croupy character, that at once distinguishes cough due to peripheral or reflex irritation, such as is noted in the cough of children, the subjects of naso-pharyngeal adenoid hypertrophy, or of 'the barking cough of puberty,' made familiar to many by the late Sir Andrew Clark.

Shortness of breath is another frequent symptom. Mayo-Collier reported a case at the British Laryngological Association in January 1897, in which severe **paroxysmal dyspnœa** was the prominent symptom. Since it very accurately illustrates typical points in etiology and symptomatology, it is worthy to be quoted with but slight abbreviation :—

'The patient, æt. 32, was married, in good circumstances, and was the mother of two healthy children. There was no history of hysteria or nervous disorders. Fourteen years ago, after a prolonged effort in nursing a relative, the patient developed some protrusion of both eyeballs, and some enlargement with pulsation of the thyroid gland. Since then her health had been good until the last six months. Latterly there had been much loss of flesh, extreme weakness, great depression, and loss of sleep.

'A marked symptom of the case was profuse sweating at all times during the day—never at night. Two months ago she was first troubled with attacks of dyspnœa, associated with a feeling of choking and strangulation. These attacks varied in frequency, but had lately culminated almost into a permanency.

'Attacks now lasted constantly two hours, with five minutes' intermission. They were entirely absent at nights. The case now exciting some alarm, I was requested to examine the larynx and throat.

'A careful examination of the larynx and nose gave no clue to the trouble. . . . There was a marked swelling at the root of the tongue, rising quite three-fourths of an inch above the epiglottis, and partially burying that structure. This enlargement was striated with large blue veins coursing from before backwards. I advised a re-examination of the chest and abdomen by an expert, and Dr. Douglas-Powell being chosen, discovered no cause for the dyspnœa.

'We agreed to operate on the lingual varix with the galvano-cautery. The first operation gave relief—less frequency of attacks, less duration; the second operation, total cessation for ten days; and third, complete relief. Tonics and general treatment were associated with operative measures.'

Dyspnœa, besides *dysphonia* and *dysphagia*, are reported by Thrasher as having been all present in the same patient.

Seiss relates a case in which difficulty of swallowing was so severe, and produced such profound exhaustion, as to call for systematic feeding with fluids for some months.

I cannot say that I have ever seen cases of very great hypertrophy of the lingual tonsil in which the gland has touched, not only the oral surface of the epiglottis, but even pushed it completely back, without producing any symptoms, such as Schaede and others have reported. It is, however, a duty to record them.

OBJECTIVE OR PHYSICAL SIGNS.—The lymphatic tissue being situated behind the circumvallate papillæ, at the very root of

the tongue, and abutting on the glosso-epiglottic fossa, nothing definite can be diagnosed without the aid of the laryngoscopic mirror; but, once the condition is thus determined, it may often be demonstrated by the firm pressure of a spatula on the root of the tongue, or, as it has lately been termed, by *direct* laryngoscopy.

By these means we can see that the amount of hypertrophy of the lingual tonsil varies in different cases. In its most often seen form there is presented a unilateral rounded and more or less mammillary mass, which obscures the epiglottis of the affected side, or it may be in two parts, representing twin tonsils (Fig. 50, coloured PLATE VI.). Fig. CCIV. represents the appearance as exhibited in several different patients whom I call to mind. I give notes of two.

FIG. CCIV.—HYPERTROPHY OF LEFT LINGUAL TONSIL.

CASE LVI.—Mrs. A. Z., æt. 47, of Folkestone, known to Dr. Eastes of that town, applied to me December 9, 1897, on account of weakness of voice, severe paroxysmal cough, and occasional blood-stained expectoration on arising from bed. Associated with the enlargement of the lingual tonsil was an obstructing spur in the left nostril. Under treatment of both these conditions, she recovered her health.

CASE LVII., in which the appearance in the throat was precisely similar, was that of Mrs. D., æt. 26. Her complaint was, that while her speaking voice was normal, her singing voice had deteriorated, especially in the lower notes, since an attack of influenza three years previously. Accompanying this there was considerable mucous expectoration each morning. In this case also there was an obstructive spur on the left side of the nasal septum.

In less well-marked cases, especially where there is varix, the condition is represented by several glandular masses, more or less conglomerated, and giving the appearance of a bunch of pink berries, the enlarged veins which ramify between them being taken as the stalks. The hypertrophied lingual tonsil often touches the epiglottis so as to imprison, or, more properly speaking, to imbed this valve, pushing it backwards, and hampering a clear view of the larynx. This was shown in one of the illustrations of the normal larynx in my first edition, published in 1878 (PLATE I., Fig. 8). Not uncommonly in cases of lingual varix and tonsillar overgrowth, it is difficult to obtain a good view of the cords in their entire length, both the glosso- and ary-epiglottic folds being hampered in their movements, in addition to a certain amount of muscular paresis which causes the epiglottic to droop. What can be seen

of the larynx is generally hyperæmic, though, as a rule, the vocal cords escape the congestion and are of normal aspect.

The appearance of the varicose veins is very striking. Kölliker has spoken of the vessels as being very numerous. The elegant arborescent and wavy manner in which they ramify, form a close network, the meshes of which often vary in size and regularity, both on account of their tortuosity and the thickness of the vessels, as well as by numerous varicose knots. These have not infrequently a close resemblance to, and may occasionally be witnessed as large as a black currant, or as a network of beads.

CASE LVIII.—A striking example of this condition was afforded me lately in the case of a medical confrère, brought under my observation by Dr. Abercrombie, one of the registrars at our Hospital (*vide* Fig. 46, PLATE VI.).

Lewin's diagram will also illustrate this appearance, though it must be admitted to be somewhat conventionalised.

Seiss says: 'Greatly dilated vessels of a purple or blue colour, and often above 2 mm. in diameter, will be found radiating in a fan-like arrangement from the fossa over the base of the tongue, the lingual surface of the epiglottis, and the lateral pharyngeal walls.'

It is worth noting that varix at the base of the tongue, although sometimes associated with varix at the sides of that organ and in the floor of the mouth, is far more often limited to the first-named situation.

Passive hæmorrhages from the throat, the next objective symptom, are generally observed on waking in the morning, the blood having doubtless accumulated during the night. Sometimes the pillow will be stained by the oozing of sanguineous saliva. These hæmorrhages may probably occur also during the day, but are only occasionally so detected by the patients, being for the most part swallowed. In cases where there is no hæmorrhagic evidence, a taste as of blood or a saline taste is complained of; in others, where there is no bleeding, there is often a notably excessive outpouring of mucus.

These hæmorrhagic oozings are usually preceded by an increased feeling of weight, or of the foreign body in the throat, and are followed by corresponding relief. The direct relation of these hæmorrhages and mucous secretion to enlarged lingual veins has been noted by Heubner, Roe, Moure, Garel, Masson, Thrasher, and Joal, and also by some of them in their association with rectal hæmorrhoids.

In this venous leakage—a term which I believe originated

with Sir Andrew Clark—will be found the explanation of many of the cases of pseudo-hæmoptysis observed in women said to be 'hysterical,' and supposed to be of factitious origin, from wounds on the gums or other parts of the mouth.

As an instance of the effect such a mistake in diagnosis, on the part of the physician, may have on the patient, Wroblenski reports the case of a lady who was brought to great mental and bodily distress by a diagnosis that her blood-spitting was due to tuberculosis, until a small varix of the lingual tonsil was detected and treated. A cure being effected, the patient soon regained her health and strength.

Several instances of such a grave interpretation of this condition have occurred in my own practice; in two of them there was an assertion of the presence of the tubercle bacillus.

One (No. LIX.) occurred in a gentleman, æt. 54, who came under my care in the year 1887, and who is still living and in good health. My colleague, Dr. Jakins, confirms this experience, and other authors besides the one quoted give similar cases.

Faucial tenesmus may be so pronounced as to constitute a real complication. Stoerk is quoted by Wroblenski as having, in a case of hypertrophy of the lingual tonsil, seen with the mirror certain spasmodic movements in the larynx, and in one instance real *laryngeal spasm*, due to overgrowth of the lingual tonsil. Joal has also reported œsophageal spasm and tenesmus as a result of the same condition of both gland and veins. A Spanish writer, Roquer-y-Casadesus, has moreover recorded a case of asthma of extreme severity, which originated from the same cause, and was entirely relieved by cauterisation; while Villecourt has even accused the hypertrophied lingual tonsil of having produced paresis of the right arm—a view which seems, even to the enthusiast, to be exaggerated.

T. P. Clark mentions chronic pharyngitis and laryngitis as complications, and I personally have noted gastric disorders set up by the frequent acts of swallowing, by which great quantities of saliva and flatus accumulate in the stomach. Langmeth appears to confirm this view by stating that after removal of the hypertrophied lingual tonsil, the digestion immediately improved, a circumstance of daily verification in my own experience.

PROGNOSIS cannot be said to be bad; certainly there is no serious danger *quoad vitam*. However, the affection may put the patient to much inconvenience and distress, if not promptly diagnosed and appropriately treated; and beyond this, there remains a fair proportion of cases in which liability to laryngitis and bronchitis of a more or less chronic character is accentuated.

In the case of singers, and in those who use their voices professionally, deterioration of the vocal powers is invariably progressive.

TREATMENT is both general and local.

It must not be assumed that all cases require local treatment, for it is certainly true that, as regards varix, at least a third of the cases were noted in my figures as a physical sign during the course of a throat examination, which, beyond assisting the diagnosis, require no further attention. It is, however, very rarely that a notable hypertrophy of the lingual tonsil is seen without inducing symptoms which call for surgical interference. This, if effective, will, in the majority of cases, be of benefit also to the associated varix, a point apparently overlooked by those who, while ignoring the importance of varicosity, have no hesitation in treating the hypertrophy by either ublation or cautery.

General measures only require mention, and must be varied according to the particular indications of constitutional disorder. While they are often only palliative, they are still more often valuable adjuvants of radical procedures.

Those most amenable to cure without local measures are those dependent on alcoholism or occupation. The habit being broken, or the calling changed, relief of irritation is often prompt and complete. Some of those also which occur as a neurosis of the menopause, are of only a transitory character. Local treatment, however, often aids in promoting their subsidence, and few are amenable to the 'moral influence' insisted on as sufficient by more than one author. Once complaint is made of the existence of local discomfort, it is difficult to dispel it by suggestion, and something more is required. It may also be remarked that rest of function is an efficient remedy in the case of voice-users, only for so long as it is adopted.

Local Treatment consists, in the first place, in rectifying the irritant character of faulty oral secretions, and in the removal of their causes. Secondly, when the degree of hypertrophy is but small, resolution may sometimes be effected by the topical use of mineral astringents—as chlorides of zinc, iron, or aluminium; or by the application of 'Lugol's' solution (liquor iodi, 1 to 20 in water, with iodide of potassium, 1½). This is a remedy in much favour with continental practitioners. Lunar caustic is an inefficient and chromic acid, a dangerous application in this situation. Walter Fowler and others have reported cases in which this last remedy so employed passed into the stomach, and caused collapse and other toxic effects. Its caustic effects are, however, instan-

taneous; and, if employed, an alkaline mouth-wash, previously prepared, should be used promptly to counteract the acidity, and to prevent spreading or ingestion. For the destruction of the varicose veins, when they appear to demand eradication, I invariably employ the galvano-cautery point, the parts being previously rendered insensitive by means of a 10 per cent. solution of cocaine or of eucaine, in strength of 5 per cent.

The method of applying the cautery is as follows:—The patient holding out the tongue, the cauterising instrument, held in the operator's right hand, is guided by the laryngeal mirror held in the left. When the lingual tonsil is hypertrophied, a broader flat electrode should be substituted, and the lymphoid tissue be destroyed at the same time that the varicose veins are sealed. The suggestion made by the writers of the article in a

FIG. CCV.—ROE'S LINGUAL TONSILLOTOME.

recent System of Medicine that 'the employment of the galvano-cautery, which is often recommended, is not free from the risk of causing violent parotitis (? parotiditis)' is only quoted to be dismissed as unduly timorous.

At times the lingual tonsil is so large that it requires to be snared, and I formerly used the galvano-caustic loop; but I now prefer a wire-cutting écraseur, or the snare known as Bosworth's.

Sometimes, again, the lymphoid overgrowth, although considerable, is so broadly based that it is very difficult to remove a sufficient quantity by this means; in such cases it may be necessary to transfix it with a needle, and pass the wire snare round it. This also may fail, and in such circumstances it is feasible

and sometimes necessary to remove the redundant tissue with an ordinary tonsillotome. This is done best by pressing down the tongue on to the floor of the mouth; but here again it is necessary to guide the instrument by the mirror, so as to obviate the possible, although not very serious, accident of nipping the epiglottis.

Roe of Rochester, U.S.A., was the first to invent the tonsillotome for use on the lingual tonsil (Fig. CCV.). It is rectangular and oblong in form, the length being in the horizontal direction. Modifications have been adopted by Brady of Sydney, N.S.W., and by myself, and the instrument (Fig. CCVI.) I employ is here depicted. In a more recent form the fenestrum has been made to take the diamond shape of the cutting blade.

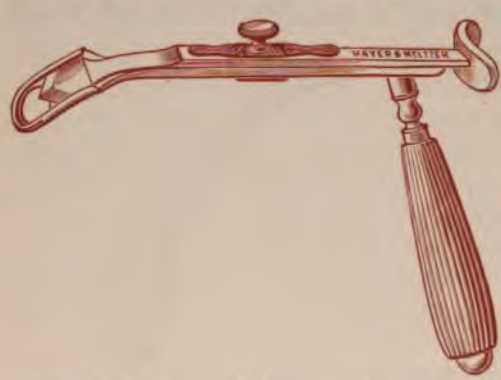


FIG. CCVI.—AUTHOR'S LINGUAL TONSILLOTOME.

When the *uvula* is relaxed, it will be necessary to effect reduction of the elongated portion at the same time, and this is best performed by means of the cautery point. In all cases of apparently simple elongated uvula, it is necessary to look for, and, when found, to treat a co-existing lingual varix and lingual tonsillar hypertrophy. In those cases in which there is an associated enlargement or congestion of the thyroid gland, iodine compresses (Form. 81) will be found to give great relief.

Nasal Obstruction has been noted as one of the exciting causes of this condition; but beyond reducing hypertrophy of the soft tissues, which, when the patient is able to keep indoors, can be done simultaneously with, or quickly following on, the procedures already described, in many cases the symptoms in this region will disappear without further surgical interference.

Operation for the removal of septal spurs or enchondromatous growth from the nose may therefore be postponed, the patient being advised to return for that purpose should the symptoms not be entirely relieved, or should a relapse take place. On the other hand, where the nasal stenosis is extreme, surgical treatment thereof taking precedence may exert a correspondingly beneficial effect on the lingual tonsillar symptoms.

HYGIENE AND PROPHYLAXIS.—None of those points already indicated require further insistence, except that of the importance of correcting faults in voice production, which may have acted as exciting causes of the trouble. Only by this means can any relief be permanent. The following are the particular defects likely to be present:—

1. Imperfect methods of inflating the lungs.
2. Waste of expiratory force in singing, or singing with exhausted lungs.
3. Mistakes as to the compass in which the voice is exercised.
4. Faults in 'joining the registers.'

OTHER DISEASES OF THE LINGUAL TONSIL.

Diphtheria and **scarlet fever,** and doubtless other infectious fevers, may make their mark on the lingual tonsil, but the probability of such a complication is more probable in the second than in the first of these maladies.

Tuberculosis, Lupus, and **Leprosy** may all invade the lingual tonsil, and the subject has received attention in each of the chapters devoted to these diseases.

Syphilis also occasionally selects this site, both for its *secondary* and *tertiary* manifestations. Schiffers has indeed reported a *primary* chancre on the left lingual tonsil, which, being discovered by aid of the laryngeal mirror, accounted for symptoms until then unexplained. Several observations of the presence of secondary plaques in this situation have been recorded which have been accompanied by marked hypertrophy of the tissues. An instance of tertiary ulceration of the lingual tonsil in my own practice is depicted in Fig. 81, PLATE IX. It was the result of a gumma, an occurrence which is not uncommon. Michael of Hamburg has recorded a case which was complicated by œdema of the glottis. It may be further remarked that while Moure and Raulin draw attention to hypertrophy of this tonsil in the case of secondary syphilis, they also believe that atrophy is a marked sequel of tertiary disease of the same site. It may be added that in all syphilitic affections of the lingual tonsil and also in tuberculosis, painful enlargement of the sub-maxillary glands is a prominent feature. The onset in all is insidious and the progress is slow. Nothing special needs to be said as to treatment.

Almost every kind of tumour has been reported as springing

from this situation, and records could be quoted of *myxomata*, *cystomata*, *lipomata*, *papillomata*, *angiomata*, and *fibromata*. I shall content myself with relating a few examples which I have personally seen of new formations of the lingual tonsil, benign and malignant.

Lymphoma.—One such case was brought under my notice by my colleague, Dr. Orwin.

CASE LX.—The patient was a female, æt. 18, who applied at the hospital with all the symptoms of enlargement of the lingual tonsil. Examination with mirror revealed a growth of the character and situation depicted on Fig. 48, PLATE VI. Dr. Orwin removed it with a snare, afterwards cauterising the base. **Microscopic examination** proved it to be a simple lymphoma, and there was no recurrence.

Fibroma.—The following case, although no microscopic investigation was made, and notwithstanding that it was bilateral, was presumably a *mixed growth* with an *excess of fibrous tissue*, and is the only one of this nature in my experience.

CASE LXI.—Mr. ——, an art student, æt. 22, living in the north of England, consulted me in November 1895 on account of post-nasal catarrh, apparently the remnant of frequent attacks of acute rhinitis. An osteo-cartilaginous bridge, which was found in the left nostril, was removed with saw and scalpel, and with beneficial result to the post-nasal flux; but the patient still complaining of a feeling of cramp and constriction in the throat, and of great fatigue after using the singing voice (a high baritone), further search was made, and I discovered not only a definite amount of varix and overgrowth of the discrete lymphatic glands at the base of the tongue, but a distinct bilateral enlargement, smooth of surface and very firm in texture (Fig. 50, PLATE VI.). This overhung and seemed to overweigh the epiglottis; and I decided to treat it by electrolysis. Commencing with six, I increased the strength to twelve cells, and, after fourteen applications, made every other day, the swellings had been so far reduced that treatment was discontinued. One application of galvano-cautery was then made to the more anterior part, for the purpose of destroying the enlarged veins, and a month later, the patient having meantime been to the sea-side, the region presented a perfectly normal appearance, and all outward symptoms had disappeared.

MALIGNANT NEW FORMATIONS OF THE LINGUAL TONSIL.

Cancer of this region is by no means uncommon to specialists, though it is relatively rare as a primary disease by comparison with similar manifestations in the faucial tonsils. All recorded cases within my knowledge have been of the epithelial type.

A partial exception was one of a sarcoma of the left faucial tonsil which descended to the larynx, and involved very distinctly the lingual tonsil. The case is described in Chapter XXVII., treating of Malignant Disease of the Larynx, but the reader may usefully refer to PLATE VI. for its pictorial delineation (Figs. 53 and 54).

The following example was reported by me in the first edition of this treatise, in 1878, and is, I think, the first recorded :—

CASE LXII.—P. W., male, æt. 44, was admitted into the Central London Throat and Ear Hospital, in September 14th, 1877, on account of an ulceration which was diagnosed as malignant. It had deeply invaded the base of the tongue, on the left side, but without involving either the faucial tonsil or the larynx. There was an enormous indurated mass at the left side of the neck, which extended from the angle of the jaw to the whole length of the trachea. The man died suddenly with barely a spasm, and on post-mortem examination œdema of the epiglottis and of the left ary-epiglottic fold was discovered. The rest of the larynx was healthy, except that the left recurrent nerve was inextricably involved in the peri-glandular infiltration, and there was wasting of the left posterior crico-arytenoid muscle.

To this I can add another of more recent occurrence from my private case-book :—

CASE LXIII.—Mr. F., æt. 58, of German birth, and occupied as a clerk, consulted me on March 21st, 1895, by the advice of Dr. Saunders of Brockley, on account of difficulty in swallowing solid food, which dated from the previous August. In fact, for the last eight months he had taken no food of firmer consistence than porridge and minced meats. The patient had suffered from primary syphilis thirty-five years previously; he was also a smoker of tobacco to the extent of seven or eight cigarettes and eight pipes per diem. He indulged in alcohol, but 'very moderately.' He stated that since the first onset of his symptoms he had lost twenty-six pounds in weight.

On **examination**, the left lingual tonsil was seen to be swollen, inflamed, and ulcerated, as depicted in Fig. 52, PLATE VI.; and a diagnosis was made of epithelioma, implanted on syphilis. Under biniodide of mercury the patient improved somewhat, but the main disease quickly reasserted its influence, dysphagia and emaciation increased, and death took place five months after his first visit.

FIG. CCVII. — PRIMARY EPITHELIOMA (SQUAMOUS) OF LINGUAL TONSIL (½ *in. Obj.*).

Mr. Wingrave, as the result of microscopical examination of a removed fragment, found that it was a most interesting specimen of a highly malignant epithelioma (Fig. CCVII.).

CHAPTER XVII

DISEASES OF THE PHARYNGEAL TONSIL AND THE NASO-PHARYNX

ALTHOUGH it is intended that this chapter should embrace other diseases of the upper pharynx, it will principally be occupied with chronic overgrowth of the lymphoid tissue, since that is the condition of chief importance in this region.

Acute and subacute inflammations of the pharyngeal tonsil may be passed over as rare in any case, and as never primary, excepting in so far as one sees acute exacerbations of Eustachian and middle ear catarrh—suppurative and non-suppurative—which may be reasonably attributed to acute inflammatory changes in that tonsillar structure. The constitutional disturbance which accompanies these attacks is quite as probably due to the pharyngeal tonsillitis as to the aural malady, to which last they are generally, though often erroneously, referred. My opinion on this point is amply confirmed by the circumstance that, with removal of the pharyngeal tonsil, neither the constitutional exacerbations nor the aural troubles recur.

HYPERTROPHY OF THE PHARYNGEAL TONSIL.

SYNONYMS.—Adenoids; adenoid growths; post-nasal vegetations; post-nasal growths.

HISTORY.—According to literary researches, hypertrophies of the naso-pharyngeal space have been recognised since the time of William Hunter. Czermak, in 1860, described a case of growths in this region; and, in 1862, Sir Andrew Clark wrote a short article on 'Naso-palatine Gland Disease.' In 1865, Voltolini and Loewenberg separately described cases of deafness associated with vegetations in the naso-pharynx. The frequency and clinical importance of these hypertrophies of Luschka's tonsil were, however, for the first time clearly insisted on by Meyer of Copenhagen in 1868. This accomplished specialist, with a

record of 102 cases, gave an admirable account of the symptoms and treatment of the condition called by him, as a result of microscopical examination, *adenoid vegetations.*

Potiquet (1893), in an elegant essay on the history of the disease and death of Francis II. of France, showed that this monarch had suffered from adenoids, which were responsible for 'a putrid catarrh of the middle ear, leading to meningo-cephalitis,' from which he died in his seventeenth year.

Meyer (1895), doubtless stimulated by this contribution, showed that adenoids did not constitute a new disease; this he did by a critical inspection of European galleries of painting and sculpture. He came to the conclusion that amongst the portraits that of Francis II. of France confirmed the clinical history given by Potiquet; and that Charles V. and Ferdinand I. of Austria were each the subject of adenoids; while amongst the statuary in the Vatican, the figures of Marcus Antonius and three others were declared by him to come under the same category.

Since 1870 much has been written on these interesting hypertrophies, but little of any importance has been contributed which was not clearly described and understood by Meyer; and almost all that is novel has been comprised in the introduction of new instruments for their more ready and thorough removal, but, numerous as they are, the majority have been of service chiefly to the inventors.

The following observation, which was recorded in my first edition, is of some historical interest, as dating the period when I commenced to give attention to the subject, which was not at that time recognised in England:—

CASE LXIV.—The case was that of a young lady, æt. 17, of handsome personal appearance, except that she exhibited the physiognomy characteristic of the habitual mouth-breather. She came under notice in October 1877, suffering in an extreme degree from every symptom which has been described as characteristic of the malady under consideration. On the 2nd of November, Mr. Clover administering chloroform, I destroyed all the hypertrophied tissues at the vault of the pharynx, having previously reduced a supplementary hyperplasia which existed on each side of the vomer. There was but little blood lost, very slight after-pain or discharge, and in a week the patient could blow out an ordinary wooden match from either nostril at a distance of eighteen inches. She became able to breathe with mouth closed during the day, and even in sleep the mouth was kept but very slightly open; and respiration, both waking and sleeping, was noiseless.

ETIOLOGY AND PATHOLOGY: **Hospital Statistics of Relative Frequency** show that hypertrophy of the pharyngeal tonsil constitutes 88 per cent. of all affections of the vault of the pharynx; and 25 per cent. of all diseases of the upper throat generally, including those of the fauces.

As regards the relative frequency of adenoids to chronic hypertrophy of the faucial tonsils, our hospital statistics of ten years ago indicated that they existed in the proportion of 4 to 10; but with the increased attention that has been given to the subject, there has been closer watchfulness, and our later figures record a positive increase in the number of adenoids over those of enlarged faucial tonsils in the proportion of 6 to 5.

Bearing in mind that allowance has to be made for a considerable number of chronically enlarged faucial tonsils in the adult, in whom adenoids have disappeared, we are able to state definitely, first, that naso-pharnygeal hypertrophies frequently exist without overgrowth of the faucial tonsils; and, on the other hand, our daily experience conclusively demonstrates the extreme rarity of enlarged faucial tonsils up to the age of puberty without a corresponding association of adenoids.

It has long been known that the pharyngeal tonsil, which is of large size in children, tends to become reduced to a minimum on the attainment of maturity, and that in most individuals of over thirty years of age it is only demonstrable on minute examination. All leucocyte-manufacturing organs, such as the tonsils and lymphatic glands, which are most developed and active during the period of growth, are more liable to hypertrophy on even slight irritation during early years of life. On reference to the anatomy of this region (Chapter II., p. 52, and Fig. XXXV.), it will be recalled to mind that there is very early manifested a disposition to retrograde metamorphosis in the shape of colloid degeneration of this portion of the tonsillar ring, which is not found in either the palatine or lingual congeners.

Loewenberg speaks of the 'lymphatic temperament' of those young persons whose lymphatic glands and various tonsils easily inflame or enlarge on slight irritation. Such a condition of vulnerability would appear to be nearly allied to struma, but this diathetic state is not considered to constitute an etiological factor by Meyer, Morell Mackenzie, Bosworth, and other authorities. In view of recent observations by Dieulafoy and Lermoyez, to be presently again considered, it is probable that in a few cases the tuberculotic tendency may be considered as a predisponent factor; but it is to be noted that the tuberculous process when present in this region, or in that of the faucial or lingual tonsils, is almost invariably latent; and when infection does take place it rarely travels beyond the neighbouring lymphatics. It is also to be remarked that the simple

presence of 'giant cells' unaccompanied by bacilli cannot be accepted as proof of a tuberculosis, latent or active.

Sajous, writing on the causation of adenoid growths, correctly places most importance on the fact that 'the liability to hypertrophic changes to which the (faucial) tonsils are susceptible in some persons exists also in the pharyngeal tonsil,' and adds 'that a continued or often-repeated inflammatory process may also act as an exciting cause. The inherent deficiency of recuperative powers peculiar to lymphatic glandular tissue being an important element in the pathology of this, as it is in simple chronic inflammation, the hypertrophic process is but the result of the continued hyperplasia.'

Geographical and Racial.—Doubtless adenoid growths are somewhat more common in countries of humid climate, but this circumstance has been considerably exaggerated as a predisposing factor, especially by those who have claimed diminished prevalence in America as accounted for by the assumption of more favourable meteorological surroundings; for Roe and others who have paid attention to the subject have given contradictory evidence which is unimpeachable.

According to Hamilton, adenoids are common in South Australia and Queensland, undoubtedly dry climates; Cantlie considers them very common in the Chinese; Tiedmann has found them of frequent occurrence in the Argentine States of South America; Ramback found them in only 0.7 or 0.8 per cent. of the children in the islands of Sumatra, but these were natives in whom, as is well known, all tonsillar hypertrophies are less frequent than in Europeans; Dentzen also finds them rare in the natives of Siam; whilst Helms has reported them as existing in 26 per cent. of the inhabitants of Greenland and the extreme north of America. W. H. Daly has shown that they are not uncommon in the Indian territories of North America, in Dacota, and in Montana. Lastly, Gongora, quoting other statistics of the country, expresses the opinion that adenoids are not seen so frequently in Spain as in Northern Europe.

Children of the Jewish race undoubtedly manifest a marked predisposition to all forms of overgrowth of lymphoid tissue in the upper respiratory passages; and this is nowhere more pronounced than in the pharyngeal tonsil. It is probable that close intermarriage is the prominent factor in this as in most other racial characteristics.

Age.—I have seen cases of children at birth unable to suckle on account of the mechanical obstruction to nasal breathing caused

by blocking of the upper pharynx, and I have operated on more than one of a few weeks old. On the other hand, I have removed well-defined adenoids at forty, and have scraped away with curette many indurated masses, which were vestiges of these growths, from the vaults of patients at an equally advanced age, who were suffering from chronic median otitis. Luc has reported a case in a patient aged fifty-four; while Raulin, of Marseilles, has observed cases in persons of sixty and even seventy years of age. Nor is this a unique experience, for Solis Cohen has reported the case of a lady, aged seventy, who was discovered to be the subject of adenoids although she came under treatment on account of a goitre. The usual ages at which cases are brought under the notice of the specialist are from five years to puberty, but they are common enough up to twenty-five.

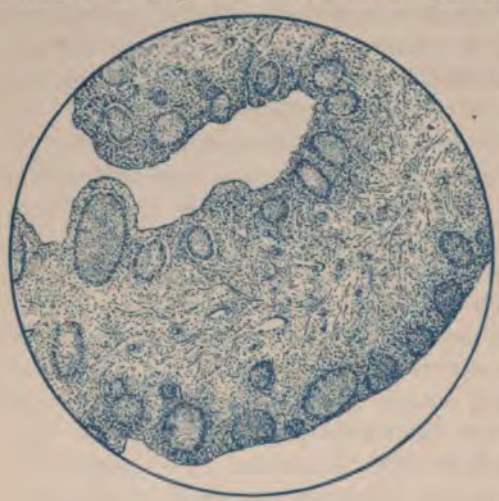


FIG. CCVIII.—SECTION OF AN ADENOID GROWTH (½ *in. Obj.*).

Sex. — Although more than one authority has suggested an increase of adenoids in the female, the sexual distribution appears to be equal. The reasons for equalisation pertain to all classes of society, for whereas boys would appear to be more liable on account of greater exposure to the influences of the weather, girls would be more prone to be unfavourably predisposed by the no less pernicious influence of a disproportionate indoor life.

Constitutional disposition to adenoids is similar to that which obtains in hypertrophies of the faucial tonsils. These vegetations are to be observed in many deaf-mutes; and, as I was the first to point out, in those who are the subjects of rickets, infantile convulsions and laryngismus—in fact, in all children exhibiting these or other evidences of the strumous diathesis.

Many who are the subjects of adenoids have an unduly arched palate, which may be causal or sequential. Boucheron has reported six cases of cleft palate, in all of which adenoids were present; and I, in common doubtless with others, have been

able to demonstrate how favourable these clefts are for studying the vegetations by direct vision (Fig. CIX., p. 421).

Most specialists regard attacks of diphtheria, of the exanthemata, and other fevers, exhibiting nasal and pharyngeal complications, as frequent factors in the induction of hypertrophic processes in the lymphoid tissues of the naso-pharynx. I would be inclined to suggest that this statement of cause and effect is often inverted, for it is quite as frequent in my experience to find tonsillar, and especially adenoid, hypertrophy influencing the severity of an acute specific fever, as for the latter to be directly responsible for the overgrowth. Some analogy may be found in the circumstance that, as with the advance of age Peyer's glands (the intestinal tonsils) show signs of disappearance, typhoid fever becomes rarer. My experience endorses an etiological explanation which brings out the association between adenoid growths and **insanitary** surroundings; but here, again, it is probable that the lymphatic diathesis predisposes to the septic inflammation, which may in turn be followed by further hypertrophy.

It occasionally occurs that no symptoms are observed which point to the presence of adenoids until adult life, and it is reasonable to believe that in such circumstances a recent inflammation may be the cause of the hypertrophy. Of the causes for this late development may be mentioned an acute or chronic coryza; infection by drainage from an accessory sinusitis, or by upward propagation from a faucial tonsillitis. Secondary syphilis has also been accused, and Gellé has especially remarked on the occasional lighting up of adenoid activity at the menopause.

Purulent and muco-purulent nasal catarrh in children, the irritant nature of which is shown by eczema of the nostrils, is almost invariably seen in association with adenoid overgrowth; but I am not sure that the purulent catarrh is always primary, for I have seen numerous cases in which removal of the hypertrophies has led to a speedy cure of the discharge.

Even where deafness is not of extreme degree, loss of hearing power is one of the most prominent features of adenoids—Clarence Blake places it as occurring in 83 per cent. of such sufferers. The varieties of deafness to be found may be divided into (1) *functional*—depending on interference with intellectual development (aprosexia); and (2) *obstructive*. The last may be further classified as acute and chronic, suppurative and non-suppurative.

Under the **microscope** these overgrowths of the third tonsil

are seen to be of such a structure as to justify the alternative terminology adopted at the head of this section. The 'vegetations' are not new growths, but merely exuberant outgrowths, or hypertrophies, of the normal lymphoid tissue of the region (p. 52). They are composed of lymphoid follicles, embedded in the retiform adenoid tissue of His, and are covered by columnar ciliated epithelium; cilia, however, are often absent at points of frequent contact or of friction with the soft palate. The miscalled giant cell formation of Pilliet has been already described in the anatomy as representing the retrograde changes normal to the tissue. Certainly, true giant cells are not to be found in adenoids in so large a proportion (3 out of 10) as this observer affirms. Nevertheless, as Lermoyez has remarked, adenoid hypertrophy is occasionally—very rarely in my experience—associated with a local tuberculosis.

SYMPTOMS AND EFFECTS.—The first may be briefly stated to be those of **impairment of the normal nasal respiration, with mouth-breathing and its usual complications.** The most important and frequent symptoms calling for post-nasal treatment are those connected with the functions of respiration, audition, voice-production, and articulation (stammering and stuttering); but such errors of function are often associated with headache, aprosexia, backwardness in study, derangement of spirits and energy; nightmare, with snoring, teeth-grinding, and disturbed sleep, and a dry mouth and throat on waking; laryngeal and pulmonary troubles, disordered digestion, and reflex croup and cough are not infrequent; indeed, as already stated, I believe that in almost all, if not all, cases of laryngismus stridulus, or false croup, the subjects would, if examined, be found to be mouth-breathers.

CASE LXV.—In a child suffering with diphtheria, I noted that a peculiarity of respiration, of 'Cheyne-Stokes' character, was observed on three nights of the acute stage, while the child was asleep, and it was further observed that this symptom was only apparent when the nasal cavities were blocked, and was relieved by treatment directed to a re-establishment of the normal nasal breathing.

Of course it is possible that cardiac depression, a result of the toxic influence of the disease, may have been more or less responsible, but cardiac symptoms were very slight in this instance, and it has since been pointed out to me that the disturbance in the rhythm of breathing in this case, as well as in laryngismus stridulus, is not so much of the nature of 'Cheyne-Stokes,' which consists of alternating periods of dyspnœa with prolonged and varying intervals of apnœa, as of that of 'Biot,' which consists of brief and regular intermissions of apnœa, the respiratory movements in the intervals being unexaggerated.

Buccal respiration due to the presence of adenoids, if marked and long-continued, and especially when the faucial tonsils are also enlarged, may give rise to serious facial and thoracic de-

formity, even in cases in which the functions of the voice and hearing have not been considered by parents and guardians sufficiently impaired to call for medical advice.

Of the **effects** of adenoids, that on the **hearing** is perhaps the most important. In many cases of deaf-mutism, these growths are found; and although their removal may not always result in restoration of the hearing, to the extent of obviating the necessity of developing the speech by lip-reading or other adjuvant systems, yet clearance of the naso-pharyngeal vault will be found to be followed by a great improvement in general strength and intelligence, and consequently by a more ready response to such educational methods. Concurrently will be observed marked improvement of the voice, especially in respect of the appreciation of modulations and inflections of tone, so conspicuously absent in the speech of most deaf-mutes. A search for adenoids should therefore be considered as an essential preliminary to the educational treatment of all these cases.

As to others, it has been already remarked that in almost all cases of high-arched and **cleft palates** in children, post-nasal overgrowths are to be found, but opinion is still divided as to their interdependence. I have but little doubt that their removal should be made a preliminary to any operation done for the purpose of closing a cleft palate, and this not only as increasing the chances of success of the operation, but also with a view of improving the disagreeable voice so characteristic of the palatal deformity, when the cleft has been closed. The teeth of mouth-breathers, especially in the upper front row, are markedly dry, and it is probable that the early **dental caries** common in these subjects is in some measure a result of the habit, a point worthy of further observation by our dental *confrères*.

The tendency of lymphoid hypertrophies to atrophy after the twenty-fifth year should be no reason for putting off the operation in young adults, because many of the symptoms, such as deafness, facial and thoracic deformity, faulty articulation and confirmed snoring, may in the meantime become irremediably established.

Since the earlier editions, I have recorded two cases in which persistent recurrence of **laryngeal neoplasms** in children had been stopped after recognition and removal of adenoids. It appears reasonable to suppose that these vegetations may be responsible for much infantile laryngitis, to be followed in a certain proportion of cases by the development of neoplastic tissue, and the hint is at least worthy of remembrance.

Amongst the effects of adenoids, that suggested by Martha, in 1892, is of some surgical importance. This author had observed difficulty of respiration after removal of the cannula in two patients who had been tracheotomised for diphtheria. No laryngeal obstruction could be discovered, but adenoids were found, and these being removed, the dyspnœa was promptly and permanently relieved. This experience justifies my recommendation to remove enlarged faucial or pharyngeal tonsils even in an acute stage of diphtheria, 'as an early substitute, or means of averting the necessity, for the more dangerous measure of opening the windpipe.'

Numerous clinical records of recent years have greatly extended our knowledge in regard to the **reflexes** of adenoid origin; and we may now say that the number and the variety due to nasal obstruction, by disease in the vault of the pharynx, are almost as great, and sometimes as apparently inexplicable, as are those from actual intra-nasal causes. To name only a few, beyond those of laryngeal and pulmonary character already mentioned—*paroxysmal sneezing*, *hay fever*, *spasmodic*, *chorea*, *asthma*, and *epilepsy* (Macdonald), *torticollis* (Knight), *headache* in daily attacks for two years (Menière), *enuresis* (Major, Grönbech, Otto, Dionisio, and others), and *genital irritation* have each and all been proved by the results of treatment to be of causal relationship.

CASE LXVI.—An example of this last came under my notice in 1894. The patient was a little girl, æt. 5, of gentle birth and carefully nursed. She had from almost infancy suffered from uncontrollable sexual irritation, for which every treatment, medical, moral, and inhibitory, had in vain been adopted. I had expressed my opinion as to the trouble being a reflex form of adenoids, and I had operated successfully on her elder brother, in whom nocturnal enuresis was the prominent symptom; but execution of my recommendation in this little girl's case was deferred for twelve months. When adopted, the relief from the irritation was immediate, complete, and permanent. The case is known to Dr. Bedford Fenwick.

The experience of Lauffs of a case of *prolapsus of the rectum* in relation to adenoids is quite intelligible to those with special knowledge, but may be received with incredulity, if not with ridicule, by those unacquainted with the far-reaching effects of diseases in the upper respiratory tract.

The case (LXVII.) was that of a child, æt. 5, who had suffered from prolapse of the bowel since she was three years old. Without thinking of this matter, it became necessary to remove a mass of adenoid vegetations which was causing mouth-breathing. As an almost immediate result the rectal trouble was cured. Lauffs ascribes the prolapse to exaggerated peristalsis as a reflex from the respiratory disturbance.

The DIAGNOSIS is often instant, for the facial aspect is almost

alone sufficient. The open mouth, flattened cheeks, collapsed and dimpled alæ, widened bridge and puffy œdematous root of the nose, down-drawn inner canthi, and the naso-labial furrow, have been already more than once alluded to. The veins about the root of the nose, forehead, and inner canthi are sometimes full and prominent, but the transverse nasal arch, long recognised by general surgeons, and viewed by the old-fashioned nurses as an omen of short life, is chiefly to be noted in early infancy; when present, it no doubt usually points to obstructions in the nose, cranium, or orbit.

On examination of the back of the mouth, the faucial tonsils are often, but not invariably, hypertrophied; masses of lymphoid tissue can occasionally be seen at the back of the pharynx, especially if the paretic palate be displaced forwards and upwards with the fenestrum of a Fränkel's depressor or by a hook. It

FIG. CCIX.—ADENOIDS SEEN IN A CASE OF CLEFT PALATE.
The faucial tonsils seen at right and left of divided uvula.

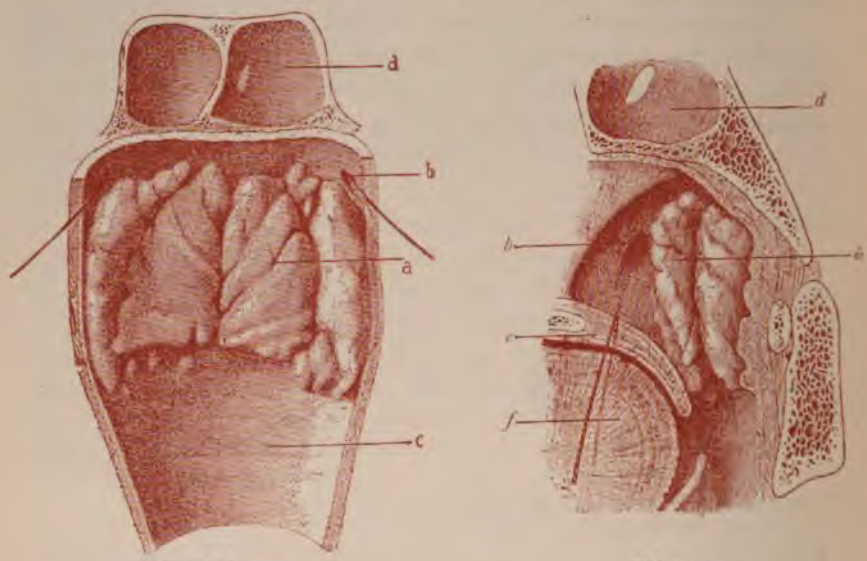
FIG. CCX.—ADENOIDS HANGING DOWN BEHIND THE SOFT PALATE.

is sometimes necessary to spray or brush away the mucous accumulations which often obscure the view, and constitute a diagnostic evidence of import. The paretic and thickened condition of the palate is also frequently suggestive of naso-pharyngeal trouble. When the faucial tonsils are not enlarged, there is seen, in addition to palatal paresis, a want of definition of the anterior and posterior pillars, and lymphoid hypertrophies may involve the salpingo-pharyngeal fold. I have more than once seen the growths hanging down behind the curtain of the palate (Fig. CCX.). Existence in children of the conditions which in the adult would be recognised as *granular pharyngitis* or *hypertrophic rhinitis*, are almost certain indications of adenoids.

All doubt, however, as to the presence of overgrowth of the pharyngeal tonsil can be set at rest by a gentle and careful digital examination; although, especially in young children, I seldom

find it necessary to adopt this measure; nor is it recommended, since it is attended by a certain amount of pain and terror to the young patient, which may create a difficulty in obtaining consent to operation, should such procedure be determined.

As a preliminary to all explorations or examinations on the living subject, the index-finger and knuckle should be protected by a guard, extemporised or otherwise. I now employ one made of soft rubber tubing (Fig. LIX., p. 93), in preference to the lobster-claw jointed metal protector which I formerly advocated.



Front view. *Side view.*

FIG. CCXI.—ADENOIDS *in situ*.
(After CASTEX AND LACOUR.)

(*a*) The Vegetations. (*b*) Eustachian Orifice. (*c*) The Pharynx. (*d*) Sphenoidal Sinus. (*e*) Velum of Palate. (*f*) Base of Tongue and Epiglottis.

Students and practitioners may do much damage by explorations of the post-nasal region, unless they have made themselves practically acquainted with the topography of the parts by anatomical study or by digital examinations on the cadaver.

In making such an examination of the naso-pharynx, the free hinder border of the vomer should first be identified; the position of the Eustachian opening, with its cartilaginous cushion, should then be made out laterally; and, lastly, the vault should be explored from the septum backwards. The growths will rarely be found actually touching the tubal prominence, but to

abound freely on the roof and posterior wall of the naso-pharynx, and they may even obliterate the fossæ of Rosenmüller.

They are often found attached to the septum, a site from which, when operation is adopted, it is most important to liberate them entirely. Every now and then these vegetations on the septum are brought forward as cases of 'lymphoma' of that region.

Reference to Fig. CCXI. (side view) shows that a soft pad or cushion is normally present in the vault of the pharynx of children, and even in that of young adults; unless this cushion is so thick, firm, and large as to encroach much on the space of the pharyngeal vault, and to obscure the sharp upper margins of the posterior narial openings, or approaches to the Eustachian orifices, the diagnosis of hypertrophy is incorrect; but when the naso-pharynx is found blocked by a rugose mass of soft, or, it may be, of tough, stalactitic vegetations, hanging in clusters from the vault and posterior lateral walls, and feeling to the touch like 'a bag of worms or currants,' or occasionally having a more friable consistence, then there can rarely be a moment's doubt in the mind of even the tyro.

Wounding of the soft palate and any bleeding more than the slight hæmorrhagic staining of the finger, which is in itself an evidence of the presence of adenoids, indicates clumsy manipulation, unless, indeed, the patient is unusually fractious. Since it is always desirable, and sometimes almost imperative, to reduce to a minimum the terrors of these procedures, both for the sake of the child and its parents, the surgeon who can satisfy himself by other signs that the abnormality exists, would always do well to defer introduction of the finger until he is called upon to adopt it as part of the surgical treatment.

Anterior rhinoscopy almost always reveals a certain degree of stenosis due to non-expansion of the nostrils, and in addition some turgescence or quasi-hypertrophy of the inferior turbinals.

M. Schæffer has noted the presence of *longitudinal folds* of mucous membrane on the floor of the nasal cavity as an indication of adenoids. Regarding this, Winckler of Bremen states as a result of an examination of 800 children, that adenoids existed in 92 per cent. of the cases in which these longitudinal folds were observed, but his figures show that their absolute presence is not very frequent. Moreover, they are not really easy of recognition in the compressed nares of young children, and I agree with Chiari that their diagnostic value may be exaggerated. I have, however, now and again noticed this phenomenon in the adult in connection with hypertrophic rhinitis, which may have

resulted from neglected adenoids in early life. In these cases there is generally an associated deafness, and curetting of the upper pharynx is often of service.

Although I am a strong advocate, both in precept and practice, of examinations by **posterior rhinoscopy,** in all cases where possible, I am bound to admit that the procedure is, for the most part, impracticable in children with naso-pharyngeal obstructions and enlarged tonsils, even with the aid of contrivances for pulling forward the soft palate. It is, moreover, scarcely worth the trouble of attempting, as such a step is unnecessary when the indications already detailed have been recognised.

TREATMENT.—The only certain method of relieving symptoms caused by hypertrophy of the pharyngeal tonsil is to remove the exuberant and obstructing overgrowth. The only question which arises is, should such surgical treatment follow promptly on the diagnosis, or may it without injury, and even with advantage, be delayed? the last alternative representing the opinion of many family practitioners and surgeons of the older school. But although this policy of procrastination has received the approval of one or two specialists of repute, Lermoyez amongst the number, no one who is familiar with the disastrous, albeit insidious, effects of nasal obstruction can for a moment accept it. Bryson Delavan expresses the view of the vast majority of laryngologists and otologists as regards the ultimate prognosis in neglected adenoid hypertrophy, that, given a case responsible for interference of function and other symptoms calling for relief, the enlargement, if 'left to nature,' seldom subsides entirely; while, on the other hand, the effects become so aggravated in intensity, and so chronic in character, that treatment at a later date is altogether ineffectual.

And here I may be allowed to quote the reply which I made to a very pertinent question asked by a distinguished surgeon at a medical society where the subject of adenoids was under discussion: 'How did children get on before the discovery by Meyer of adenoid vegetations, as a cause of deafness?' and it might have been added, of the other results of these hypertrophies. The answer was: 'That formerly in those cases in which there were enlarged tonsils, removal did exert a certain, and in some cases a remarkable, improvement in the hearing. But, as in many other instances in surgery, with our later knowledge of the subject we should not now be satisfied with the results we then obtained; since, though doubtless cases might be seen in which there were adenoids without enlargement of the tonsils, yet in upwards of 90 per cent. of

the latter condition the former also exist; and therefore it has become a fixed rule in my practice in such cases to search for adenoids, and if present to remove them as an essential part of the operation of ordinary tonsillotomy. Of course there are still surgeons living who object to remove adenoids, as there are even yet some who deprecate removal of the faucial tonsils, on the grounds that children *will grow out of them*; but it ought to be remembered that, even if tonsillar hypertrophies do become reduced with advance of age, the subjects have in the meantime *grown into their symptoms*, and that one sees every day cases of deafness and other results of adenoids in adults and in middle life which might have been prevented had knowledge been more perfect when the patients were children.'

For reasons to be presently stated, removal of adenoids is not to be undertaken lightly; but since the complications to be dreaded occur in an inverse proportion to the care taken in preliminary procedures in the various steps of the operation itself, and in the after treatment, it is necessary to enter into all these points with the detail observed at our hospital.

1. The patient's temperature is always taken, and, on indication given, the operation is deferred, and a short preliminary course of constitutional treatment adopted—of which dieting and moderate purgation are the chief.

2. The ears are inspected, and wherever there is accumulation of wax, it is removed, since neglect of this apparently trivial procedure may aggravate, or even precipitate, middle-ear inflammation as a sequel of operation.

3. In the case of already existing purulent discharges, from either the ear or the nostrils, antiseptic irrigations are adopted as an indispensable preliminary.

4. Independently of the question of anæsthetic, a full interval should be enforced between taking food and the operation.

5. A minor preliminary, but of considerable importance in relation to the comfort of all concerned, is attention to the emptying of both bladder and rectum of young patients.

6. Sanitary precautions in the sick-room surroundings of private patients are of course easy, and the same may be said as to the facilities for operating in such cases in a surgical home. But with hospital patients, the majority of whom cannot be admitted into wards, much may be done to avert septic sequelæ, by appropriate recommendations and prescriptions. It is almost needless to add that where, as in hospital, several patients may be operated on in quick succession, the instruments are to be steril-

ised by boiling between each case, and all other precautions against septic transmission are to be adopted by the surgeon and nurses.

As to the operation itself—the first point is that of *anæsthesia*. The reasons for a strong preference in favour of *nitrous oxide gas* over the major anæsthetics have been given with detail at pages 186 *et seq.* It may, however, here be noted that in very young children, and especially those with enlargement of the faucial as well as of the pharyngeal tonsil, the amount of anæsthetic required is exceedingly small, and these are the cases so prone to fatal asphyxia, even before the operation is commenced, when chloroform is ill-advisedly employed. Cocaine or eucaine sprayed into the nostrils from the front and behind the uvula may be sufficient in the adult.

The next point is that of *assistants*. Where possible, two should be engaged, and one of these may be a nurse, preferably one educated to the special requirements of the occasion, for much of the success of the operation, both in rapidity and effectiveness, is dependent on the intelligent co-operation of the helper.

The *position* of the patient, taught me by Morell Mackenzie, adopted in my practice for upwards of thirty years, and uniformly observed by my hospital colleagues, is the upright sitting in a high-backed chair—exactly as that recommended for ordinary tonsillotomy, which is so frequently an essential complement to adenoid removal. Patients of all ages are apt to struggle under the influence of gas; and a kicking-strap attached to the chair serves the double purpose of restraining the legs and of preventing the patient slipping from the seat. In the case of very young children, the little one is placed on the nurse's lap, its legs being secured between her knees.

I have yet to see the case in which, *under nitrous oxide gas*, or *without anæsthetic* at all, advantage would accrue by the adoption of the recumbent position with head over table, or any of its modifications.

The patient being anæsthetised, or otherwise made ready, Wingrave's prop is first introduced. Faucial tonsillotomy, where it is demanded, should precede that of adenoid removal, and there is no reason for making the two procedures separate. Indeed, as the daily practice of our hospital demonstrates, the expert surgeon can remove both faucial tonsils and effectually clear the pharynx of adenoids within the forty or fifty seconds of narcosis that can be secured by a skilled anæsthetist in a single administration of the gas. Where this cannot be achieved, there

is no objection to a second or even a third administration of the anæsthetic.

There is no lack of instruments from which to choose. Of forceps, all of them are curved; some open laterally, some antero-

FIG. CCXII.—FORCEPS FOR ADENOID GROWTHS. A. SCHUTZ'S ANTERO-POSTERIOR. B. LOEWENBERG'S POST-NASAL.

posteriorly; these are passed into the naso-pharynx by the mouth. I prefer Schutz's pattern (Fig. CCXII.A), which nip the glandular tissue from before backwards, for collecting accumulations in the posterior portion of the pharynx; while Loewenberg's, (B) or one of the many modifications of the same, which open laterally, are appropriate to masses in the roof, and near to the Eustachian

FIG. CCXIII.—NASO-PHARYNGEAL CURETTES.
These illustrations are not drawn in proportion, both the shank and the handle being represented as too short.

tube. By these means the growths are removed piecemeal, some four to six insertions of the instrument being necessary. Curetting of the naso-pharynx is an operation that can also be efficiently performed by means of an instrument introduced through the mouth; Hartmann's pattern (Fig. CCXIII.A) is the

best for lateral curetting; Gottstein's (B) for posterior. Guarded instruments to prevent fragments from falling into the larynx are as useless and impracticable as they are unnecessary.

Almost as soon as the instrument is introduced behind the soft palate, thick grumous oozing will be observed to issue from the anterior nares, and this is another confirming point of the diagnosis.

I condemn reduction by the galvano-caustic loop or electrode in children, because this method, even in skilled hands, not infrequently leads to acute inflammation of the Eustachian tube and tympanic cavity. The same may also occur from injury of the tubal orifice, a by no means uncommon result of unskilful manipulations of the forceps or curette. A thimble-shaped curette worn on the index-finger was much in vogue a few years ago, and I have occasionally employed it; but for finger removal I have discarded all instruments in favour of the index-finger-nail of the surgeon, previously hardened by being dipped into absolute alcohol. This method of nail-scraping is to be employed only in very young patients, in whom the growths are of soft texture, or as an adjuvant and complement to the forceps; but it must not be taken as a measure which requires less skill or knowledge, for whatever the means employed, the instrument or finger must be guided according to the directions just laid down for digital examination, and with a due regard to the possible complications to be immediately considered. *Arte non vi* is a maxim of especial application to this operation, but would appear to be not infrequently ignored.

There is generally some bleeding, but this is seldom of serious extent. After abscission of the faucial tonsils, the head of the patient is pushed slightly forward, so as to prevent any chance of blood running back into the trachea; but even if that occurs, recovery from narcosis under gas is so rapid that no danger on this score need be anticipated. I can only say that, of the thousands of cases in my own practice and that of my colleagues who operate under influence of the same anæsthetic, with the patient in the sitting position, *no death has occurred.* On the other hand, I was shocked when, in the discussion to which I have already alluded, three speakers gave experience of fatal issues, four different cases in all being recorded. If I am correctly informed, two deaths have actually occurred in the same family from chloroform narcosis, administered for this operation; neither the family practitioner nor the operating surgeon having given heed to the lesson of the first fatality.

After-treatment.—When the operation has been completed, the patient, before leaving the chair, may be encouraged to clear the nostril with the handkerchief; but anterior nasal syringing or posterior nasal douching with simple alkaline solutions, which used to be adopted for a few days or weeks, are not nowadays employed, it being *considered safer to leave the parts alone for at least forty-eight hours*, the better to prevent the risk of median otitis. Gargling is of no service; but antiseptic mouth douches with the throat syringe (Fig. XCI., p. 143) are both beneficial and refreshing (Form. 73, 74, 75, 76, 78, or 80). For further remarks on after-treatment the reader is referred to Chapter XV., where that of tonsillotomy is discussed. The only point of difference is that perhaps more blood is apt to pass into the stomach after removal of adenoids, and hence the necessity for an earlier purgative; often it may be given with advantage on the same evening as the operation.

Complications.—From the foregoing it must be recognised that the operation is by no means so simple as it has lately become the fashion to describe it, nor is it free from dangerous accidents. These present themselves as both *immediate* and *remote*. In the first group may be named syncope and asphyxia from passage of blood into the trachea—not unknown in cases in which chloroform has been administered; convulsions from shock, and cerebral disturbance, and excessive hæmorrhage; of minor importance are injuries to the teeth and mandible, from too zealous use of lever mouth-gags.

Reference must also be made to the button-holing of the pharyngeal tissues, the result of too energetic curetting or of even nail-scraping; and injury of the Eustachian orifice, to be followed by cicatricial bands of adhesion. Reference to Fig. CCXI., p. 422, will also suggest the advisability of gentleness when working in the neighbourhood of the sphenoidal cavity; this caution is of all the more importance in the case of patients above the age of ten years.

Of more or less remote sequelæ of disaster, secondary hæmorrhage may occur; while septic infection, showing itself in (1) traumatic fever, (2) suppurative otitis and mastoiditis, (3) erysipelas, and (4) cellulitis and pyæmia, is to be mentioned, because, unfortunately, of more than suggestive importance.

The traumatic fever here noted is sometimes accompanied, as it is also occasionally in cases of faucial tonsillotomy, with a 'surgical rash,' which partakes of the nature and runs the course of a roseola. Not infrequently it terminates in desquamation,

and on this account the term 'surgical scarlet fever' is sometimes employed. If investigated bacteriologically, a streptococcal infection will be generally found responsible. Sendziak has lately recorded the lighting up of a malaria in children after this procedure. I have seen one or two examples of this, not only in children born in tropical climates, but also in adults who have been resident in such regions, and particularly in relation to nasal operations; and this to such an extent that I always in such cases, both in advance of operation as well as afterwards, administer quinine as an integral part of treatment.

The precautions to be adopted so as to avert these complications need no elaboration, but a word or two may be said about hæmorrhage, beyond what is contained in the remarks on this point with regard to faucial tonsillotomy. As causes of excessive bleeding, peculiar to adenoids, may be mentioned an unduly fibrotic density of the vegetations, as observed in two instances by Cartaz; while abnormality of the internal carotid or vertebral arteries, mentioned as a cause for bleeding in removal of the faucial tonsils, is also of import. Schmiegelow has reported a case in which fatal hæmorrhage, after removal of adenoids, was due to a wound of the carotid which took an unusual course. The steps to be adopted for arrest of bleeding in this situation are those recommended for epistaxis (Chapter XXIX.).

An important question is that of the **recurrence** of these growths, and the necessity for a repetition of surgical measures, the one, however, not being entirely dependent on the other. Answering the last point first, a second procedure, due to an imperfect attempt at removal, may be largely averted by careful digital examination as a last step of the operation, so as to assure the surgeon of a complete clearance. If but a small fragment be left, it often happens that the inflammation consequent on the operation may lead to a rapid hypertrophy of this remnant. In many of these cases, however, this apparently new overgrowth will be almost as quickly absorbed, and I am therefore not in a hurry to perform a second scraping, which may be necessary in the hands of even the best surgeons; but the necessity of more frequent repetition is seldom called for, unless the previous ones have been incomplete from want of skill or experience, or where the growth has not been of the benign character anticipated.

Dèlie has given consideration to the possibility of a *sarcomatous transition* occurring in remnants of adenoids; and although he draws conclusions in favour of such a malignant change, general experience renders it probable that the growth in such a

case would be malignant from the first, and that this fact would explain the 'recurrences.' This observer's further remark that the clinical characteristics of sarcomata in this region may be masked, and that the microscopical features cannot alone establish a diagnosis, is of real value and in accordance with common acceptance.

In this category further consideration may be given to the possibility of a *tuberculous process*. Lermoyez goes so far as to say that in some cases adenoids are only an expression of pharyngeal tuberculosis; and relates two cases, in one of which, the growth reappearing, was proved by bacteriological and histological examination to be of a tuberculous nature. This decidedly exceptional experience, and a belief that removal of adenoids so infected may precipitate in a general tuberculosis, would appear to be the foundation of the timorous attitude against operation adopted by this ordinarily courageous surgeon.

In many cases in which free nasal respiration is not established after the operation, there will be found a persistent vascular hypertrophy of the posterior portion of the inferior turbinal, or some other intra-nasal cause of obstruction, such as a deviated septum or a spur; but, as a rule, both the turbinal engorgement representing the *quasi-hypertrophic rhinitis*, as well as the *granular pharyngitis* previously mentioned as concomitants of adenoids, will disappear with the re-establishment of free nasal respiration. The younger the patient the greater is the probability of this happy result.

Many cases of *deafness*, due to impeded Eustachian ventilation, are likewise cured without further direct measures for improving the patency of the tube, but in some a course of Politzer inflation may be required. Such treatment should in no case be commenced within a fortnight of the removal of the growths.

When *mouth-breathing* continues during sleep, with persistence of the objectionable habit of snoring, the nasal breathway being free, I advise that the lower jaw should be held up by a lightly-tied bandage or other support, such as Guye's 'Contra-respirator' or an 'Anti-snorer,' worn under the chin and over the head, for a few weeks or until the habit is cured. Where there is paralysis from disease of the dilator muscles of the nostrils, I advise gymnastic exercise, in the shape of forcible nasal in- and ex-halations to restore their action.

In cases of *stammering* and *defects of articulation*, the removal of the impediment to the action of the soft palate will have a like happy result, and I have often witnessed the circum-

stance that children the subject of hesitancy will speak without impediment for a day or two after the operation. Relapse is, however, almost invariable, so that after-education is always essential for restoring and making permanent functional activity in the long-disused or never previously exercised muscles.

Tornwaldt's Disease.

Allusion has been made to the pharyngeal bursa as a vestigial structure on pp. 53, 126, and 243. The affection which bears the name of Tornwaldt represents a subacute or chronic inflammation leading to a pocketing of pus at its site in the centre of the pharyngeal vault. It is now generally looked upon as a sort of legacy of incompletely absorbed adenoids, but it is not common. Some two or three cases have come under my observation which agree with Moure's description of what he calls **chronic encysted abscess of the naso-pharynx,** or as I would say **encysted growth,** for it is not always an abscess. When posterior rhinoscopy is possible, there is seen a round, smooth, and rosy coloured tumour, which on removal is found to be lined with cylindrical epithelium. The contents, however, are not always purulent, but rather glairy, adhesive, and stringy.

The **symptoms** are mainly discomfort as of a foreign body, and the hawking up of a tenacious and more or less purulent and blood-stained fluid which is quick to reaccumulate.

Treatment is generally protracted because of the difficulty of eradication. The surgeon will try curetting, removal of cyst walls with forceps, firm swabbing with iodine, or with a strong solution of chronic acid—followed quickly by an alkaline douche —or finally by an application of the galvano-cautery to the vault, a procedure to be adopted with great caution.

Naso-Pharyngeal New Growths.

Under this heading are included such tumours as teratomata, myxomata, fibromata, sarcomata, and carcinomata. Of these, fibromata are by far the most common, while the more malignant tumours are exceedingly rare.

Teratomata merit but a passing word, since they are of such rarity as to be viewed mainly as pathological curiosities.

Myxomata are often seen in the naso-pharynx, but they nearly always spring from the mucous membrane of the nasal passages proper; their pathology, symptoms, and treatment

are detailed in Chapter XXIX., which treats of Intra-nasal Diseases.

Fibromata differ in no way from true nasal growths of similar structure; they spring from the periosteum or connective tissue of the vault of the pharynx. They grow and encroach by pressure on neighbouring areas much more rapidly in the young than in adults. In addition to the usual symptoms of post-nasal obstruction, they are accompanied by pain, hæmorrhage, and other symptoms characteristic of true nasal fibromata. Headache and aprosexia are always marked when the growths attain any size.

DIAGNOSIS is easy on account of the pain, bleeding, and consistence of the tumours. They are usually attached by a broad base, and are only successfully **treated** by bold operative measures.

These consist during early stages in removal of the mass of the tumour or tumours, by evulsion with forceps, or strong and suitably curved wire écraseur, the snare of the latter being passed behind the soft palate and then adjusted. In some instances a strong snare may be preferably passed through the nose. The base of the growth requires energetic eradication by a thorough curetting, and the destruction of the whole of the morbid area from which the neoplasm springs by the later application of galvanic or other form of cautery. These operations are usually attended with considerable hæmorrhage, and although never alarming in the few cases I have seen, serious loss of blood has occurred in several reported instances. When the area of attachment is very large, and where the growth has encroached on the base of the skull or pterygoid region, Rouge's or Ollier's or some other external operation may be necessary; but this emergency seldom arises in the practice of the specialist familiar with the territory.

Interference by operation with **sarcomata** and **carcinomata** in this region, though justifiable in some instances, has not been, up to the present, encouraging. Electrolysis in the **fibro-sarcomatous** form has been employed by me successfully in two cases; but I failed to influence the growth with the same treatment in two others.

CHAPTER XVIII

DISEASES OF THE LARYNX

ANÆMIA, HYPERÆMIA, LARYNGITIS

(Open out PLATES VIII. *and* X. *at end of the Book, during perusal of this Chapter)*

THE larynx is subject to all the affections peculiar to a mucous tract, with certain additional disorders due to the structural arrangement and its functional purposes: thus we have anæmia, hyperæmia, congestions, inflammations, ulcerations, and cicatricial deformities, with thickenings due to interstitial changes. All these are either of a simple character, or associated with some specific poison, and may be acute or chronic.

Any interference with the power to open or close the rima glottidis will impair both respiration and vocalization; and the same will result if the chink be narrowed by inflammatory thickening, membranous exudation, cicatricial adhesion, or new formations. The framework of the larynx being composed of cartilages and their articulations, morbid processes may extend to these tissues, leading to ossification, anchylosis, caries, and disintegration.

Lastly, external disease may by compression diminish the calibre of the larynx, or it may invade the canal itself.

ANÆMIA OF THE LARYNX (Fig. 89, PLATE X.).

When the patient is suffering from general anæmia, whether due to hæmorrhagic loss or chlorosis, from Bright's disease or diabetes, the larynx may experience a diminished blood supply, in common with that to the rest of the body. Laryngeal anæmia is of significant importance—(1) When it is associated with functional aphonia; (2) when, during the course of an attack of chronic laryngitis, the mucous membrane covering the ary-

epiglottic folds, arytenoid cartilages, and ventricular bands is abnormally pale, while the vocal cords are the seat of indolent congestion, the patient not being generally anæmic. In both these cases the condition may be the premonitor of laryngeal tuberculosis; it will therefore, when so occurring, be more properly considered in the chapter on that disease.

The laryngeal mucous membrane may partake of the characteristic change of the cutaneous surface observed in cyanosis and in jaundice.

Treatment must naturally depend on the primary cause, and all local measures, as stimulating inhalations, lozenges, etc., should be secondary to general tonic remedies.

Hyperæmia and Hæmorrhages of the Larynx.

This condition seldom occurs except as the precursor or sequel of inflammation, congestion of the laryngeal mucous membrane being usually due to catarrhal influences. Active hyperæmia is also observed in the larynx of persons habitually using the voice; of those addicted to chronic alcoholism, or to the excessive use of tobacco; of those working continuously amid acrid chemical fumes, as of phosphorus and the corrosive acids or alkalies, smoke, dust, or other impurities, in ill-ventilated rooms. In these the congestion, though not always reaching the stage of disease, renders the subject thereof most prone to contract more acute inflammation.

As first pointed out by myself many years ago, the larynx of many voice-users is in a state of active hyperæmia of varying intensity, without the existence of any pathological symptoms. This circumstance, however, will explain one of the predisposing causes of this class to laryngeal inflammations.

Pathology.—The various regions of the larynx differ widely in the amount of hyperæmia they exhibit, and such differences depend in most part upon the relative thickness and tension of the mucous covering and the structures lying immediately beneath. Hyperæmia is always more diffuse and pronounced where the submucosa is loose, as upon the ary-epiglottic folds, ventricular bands, and the ventricles; whereas over the epiglottis, vocal cords, and subglottic region, only comparatively slight differences in colour are to be observed, even in congestions of rather marked intensity. Besides being present in all acute processes, hyperæmia of the mucous membrane of the throat is an almost invariable accompaniment of the exanthemata. Slight

ecchymoses frequently happen during active hyperæmia, but otherwise hæmorrhage is of rare occurrence, except from mechanical injury. A case has been reported by Türck, in which hæmorrhage resulted from syphilitic ulceration in the sinus pyriformis, leading to corrosion of the lingual artery. This is the only instance recorded of such an accident, though many authors mention the possible danger of its occurrence. Hæmorrhages are not infrequent in carcinoma, and are occasionally witnessed in phthisis. A case in connection with the last-named disease is illustrated in Fig. 90, PLATE X.

Another interesting instance of this rare condition is illustrated in Fig. 76, PLATE VIII. It was probably an example of what Navratil has termed *Chorditis hæmorrhagica.*

CASE LXVIII.—The subject was a young girl, Charlotte Y., æt. 18, by occupation a seamstress, who was seen by me at the hospital, in February 1879, in conjunction with my former colleague, Mr. Hamilton. She applied on account of complete loss of voice, and the appearance presented in the picture was seen on laryngoscopic examination, viz. general anæmia, with the exception of the vocal cords, which were coloured with moist blood. On wiping the hæmorrhagic covering away, the cords were seen to be markedly hyperæmic. There was but little history obtainable, except that of poor feeding and general debility with amenorrhœa. The patient stated that she had often tasted blood, and had spat a little into her handkerchief at early morning, but had never had further evidence of hæmoptysis. The lungs were weak, but not actively diseased.

The girl improved under internal administration of iron and ergot, and her voice was restored as her strength was regained; but, except on her return from a Convalescent Home, she was not again seen.

Venous congestion is by no means so infrequent as is generally stated. Passive hyperæmia is seen in emphysema, and it may also be caused through the pressure of external tumours, by severe cough, and by anything leading to straining or forcing of the vocal or respiratory functions. It is perhaps needless to mention that in icterus, as well as in gangrenous processes in the lungs, the lining membrane of the larynx, in common with that of the pharynx, takes on that discoloration in which all other mucous surfaces then participate.

SYMPTOMS: **Functional.**—The **voice** is generally somewhat hoarse; **respiration** is unembarrassed, unless there is nasal or pharyngeal stenosis; **cough** exists rather as result of a desire to clear the throat of supposed irritation than from more direct cause; and **pain** with sensation of dryness or of a foreign body is occasionally experienced.

Objective symptoms are at once revealed by the laryngoscope, and consist of increased coloration of the mucous membrane, in varying degrees of uniformity and intensity. The

amount and situation of varix are always to be verified by direct inspection, or by the laryngeal mirror.

In the case of hæmorrhage, the source of bleeding may sometimes be accurately ascertained, as is seen in the illustrations in PLATES VIII. and X.

PROGRESS AND DURATION.—Neglect of a congestion of the larynx is likely to lead to subacute or chronic laryngitis, and may be a predisponent to even more severe grades of inflammation. A hæmorrhage from the larynx is almost invariably indicative of serious disease.

TREATMENT should in the case of secondary hyperæmia be modified according to the cause, with adoption of measures, local and general, of much the same nature as recommended for chronic laryngitis. In hæmorrhages, insufflations of alum, or introduction by the laryngeal syringe or brush of solutions of persulphate of iron, half to one per cent., are preferable to similar applications of tannin. Stockman's recent experiments have shown that the action for good of this last-named drug depends on its power of precipitating albumen, the layer of tannate of albumen which is formed acting as a protective to the underlying mucous membrane; but it has also been shown by Rosenstirn and Fikentscher that tannic acid when locally applied, so far from causing contraction of blood vessels, is actually followed by their dilatation. Internal administration of tannic and gallic acid has also been proved to be of no effect on the respiratory mucous membrane. In cases, therefore, of laryngeal hæmorrhage, iron and ergot are preferably indicated. Wherever there is evidence of portal obstruction, depletion by means of mercury and saline aperients is demanded.

LARYNGITIS.

(*Open out* PLATE VIII. *at end of the Book, during perusal of this Section.*)

Much confusion has been occasioned in the classification of inflammatory diseases of the larynx, by the want of agreement on the part of various authors as to the significance of terms. It is here proposed to arrange laryngeal inflammations in separate order, principally in relation to the nature of the structure involved, each in its acute and subacute or chronic form, and to the individual character of the morbid process.

The laryngeal complications occurring during the course of certain continued fevers and of the exanthemata vary in nature

and degree proportionate to the characteristics and gravity of the primary disease; and no practical advantage is to be gained by a separate description of each of these secondary inflammations as if it were a different malady. Nor does it seem necessary to recognise, as distinctive diseases, varieties of submucous inflammations, dependent on the nature of the infiltration. It is quite otherwise with the laryngitis associated with syphilis, tubercle, etc., in which the etiology, pathology, and the whole course of the malady are of such a *specific* nature as to demand distinct consideration, and quite special methods of treatment. But between simple non-specific and specific inflammations there comes a class—the exudative or membranous—which may be considered to some extent common to both, including as it does both diphtheria and pseudo-diphtheria.

1. Acute.

Synonyms.—Catarrhal laryngitis; Mucous laryngitis. (Figs. 69 and 70, Plate VIII.)

Acute inflammation of the lining membrane of the larynx differs in no particular from that of any other mucous surface, except inasmuch as may be due to the varying relations of tension and thickness of the different portions of the subjacent structures. This influence is exercised to a less extent in inflammation of the mucous membrane itself, than it is when the submucous tissue is invaded.

The disease has also some features of distinction, according to the age at which the attack occurs. It is decidedly a more dangerous malady in children than in adults; happily it is also far less frequent. An attempt has been made by some authors to treat the laryngitis of children as a separate affection, on account of certain differences in its morbid anatomy. Such differences are believed by me to be due to the greater tendency in the young to plastic exudation as a result of inflammations of mucous membranes, of which plastic bronchitis may be cited as an example, and not to any definite pathological changes different from those of a laryngitis when exhibited in a person of full age. Doubtless, also, the small size of the larynx in the child influences the severity of infantile laryngitis.

Etiology.—In the most commonly accepted sense implies, a catarrhal tendency is the strongest predisposition of this form of laryngitis. The general circumstances which give rise to the catarrhal state have been fully dealt on in Chapter X., and

need not be again enumerated; but in considering the various predisposing and exciting causes of catarrh, as it may affect the larynx, it is necessary to keep always in view the two most important functions of the organ—that of respiration and that of vocalisation. The duty of the epiglottis in deglutition is hardly at all affected in simple catarrhal inflammation, and we need not therefore enter into present consideration.

It is generally stated that the exciting causes of a simple laryngitis are similar to those which lead to the œdematous form. Successive authors, following their predecessors, have taken no trouble to ascertain whether the nature of the 'cold-catching' or catarrhal, factor has any influence on the character of the resulting inflammation; and we thus find the same atmospheric and hygienic causes ascribed indiscriminately as predisponents or excitants of every variety of laryngitis. In attempting to differentiate them, I do not venture to speak dogmatically, since my views are offered as suggestive reflections on past experience, and for future correction or confirmation by others, rather than as the ascertained results of systematised investigation.

First in importance amongst the causes of catarrhal laryngitis are the *atmospheric*, the principal of which is the inspiration of moist cold air, especially by those who habitually breathe through the mouth, or who are the subjects of temporary **nasal stenosis.** Gottstein considers that 'no mucous membrane, except that lining the nose, is so prone to inflammation, as a result of climatic influences, as that of the larynx.' I quite agree with this opinion, with the modification that the major proportion of laryngeal catarrhs are the direct result of nasal obstruction, and that propagation of acute inflammation from the nose to the larynx is, in my view, second only in frequency to the direct inspiration of noxious atmospheres by the mouth. I am inclined to doubt whether, as generally stated, a laryngeal catarrh ever really ascends to the nose, giving rise to a secondary nasal catarrh. Differing from generally accepted statements, I have not found that exposure to keen winds, the inspiration of dry cold air, or of hot (atmospheric) air, or of meteorological changes from heat to cold, *unaccompanied by moisture*, act specially as etiological factors of catarrhal laryngitis.

The influence of *wet clothing* of body or of feet is the next hygienic cause commonly assigned; but its direct influence in producing a laryngitis rather than a rheumatism or any other form of inflammation is often, though not invariably, regulated by certain functional circumstances. It is not always necessary for the individual to have been using his voice during the time of

exposure, but a laryngitis will preferably occur from such a cause in one whose profession necessitates much use of the larynx in speaking or singing, especially if nasal respiration is impeded.

The following cases illustrate the influence of exposure to damp and the retention of wet clothing as conducing to laryngitis, the first associated directly with vocal duty; the second with but very slight predisposing circumstances of excessive functional activity of the larynx:—

Case LXIX.—The Rev. Canon —— consulted me in July 1896. He reminded me that he had been under my care five years previously, on account of chronic pharyngitis and relaxed uvula, and reported that, since treatment for that condition, he had remained well until quite recently, when he had ridden on a bicycle to church some distance from home. Overtaken by a storm, he had arrived soaked through, but had been obliged to straightway perform a service without the opportunity of changing his wet clothes. The same night a sharp attack of laryngitis was developed, and indeed his voice had not since returned. This was due to a paresis of tension, which, commencing with the acute onset, had remained constant.

Case LXX.—Major C., of the Royal Engineers, consulted me, by the advice of Mr. Pittock of Margate. He had come home, after long service in the Bengal Presidency, on sick leave from Indian fever, travelling by way of America. He had suffered for some time from pharyngeal irritation, which was increased by taking cold after walking under the Falls of Niagara, when he was freely besprinkled with water. He thinks he may have shouted a little to make his voice heard over the noise of the falls; but not till next day did he suffer, when he felt increase of the throat irritation, and spoke with a hoarse voice. With a day or two of careful nursing he was quite convalescent. He arrived home, and a few weeks later went to Scotland, when a more serious relapse occurred. This was brought about by the checking of heavy perspiration, induced by a long walk across the hills. Then, while fishing, and although protected from wet in wading, he felt a distinct chill, to be followed the next day by acute inflammation of the larynx, from which he suffered for several weeks. When I saw him the disease had become subacute.

And next, as to use of the voice as a cause of laryngitis. Doubless functional activity of the larynx, leading to hyperæmia of its mucous lining, may act to a certain extent as a predisponent; but a careful analysis of a number of cases has assured me that the atmosphere in which the patient has spoken, and especially the method of his elocution, are far more important factors, and that the immunity of the individual to attacks is in proportion as these conditions are favourable to functional health. In the same way may be explained another frequently assigned predisponent—previous attacks—these occurring especially in the case of those in whom the importance of the above-named circumstances is either unrecognised or neglected.

The following is a typical illustration of an almost everyday experience in this direction:—

Case LXXI.—Mr. A., æt. 31, had used his voice but moderately in public till May 1885, when he became a candidate for a seat in Parliament. He had never had instruction in elocution, and was called on to speak at meetings twice or thrice a week. In October

he endeavoured to address a gathering of 5000 to 6000 in a covered drill-shed. He was sensible from the commencement that to reach his audience would be difficult. He therefore shouted with all his force. The result was that he felt his voice go before he was half through his speech. He was hoarse the whole of the rest of the campaign, till his election in December, when he placed himself under treatment of a specialist, who told him he had 'strained his vocal cords.' His voice did not entirely recover till after a course of two or three months of bi-daily inhalations, and almost daily insufflations, combined with absolute rest of the organ. Another election campaign was commenced in June, and his voice served him well until attendance at a small meeting—not more than 600 or 700—in a gas-lighted and ill-ventilated hall. Here he sat for an hour and a half before his turn to speak arrived, and again he felt his voice fail him, and a sense of fatigue after a comparatively short address. He drove home—twelve miles—in a closed carriage, with open window. The next day his voice was fairly well, but the day following it was quite gone, acute laryngitis having supervened. As soon as he was able to leave his room he came to town, and was seen by me. The larynx was still in a state of subacute inflammation, with considerable pharyngeal congestion and relaxation.

In almost all cases of laryngitis a low state of the system is a predisposing cause, and constitutes one explanation of the frequency of laryngeal and pulmonary inflammations incurred after exposure at funerals; the grief and depression of bereavement, following in some cases on long and anxious watching, having weakened the powers of resistance against noxious exciting causes.

An example of this nature presented itself in the person of

Mr. L., æt. 50 (CASE LXXII.), a schoolmaster, who having since the age of 15 been engaged in teaching, had for many years suffered from slight throat trouble in winter, and a frequent feeling of vocal fatigue, from which, however, he had always recovered after a summer holiday spent in his native air of Wales. A severe attack of laryngitis quickly followed return to work after a vacation which had been occupied entirely in nursing a sister and a mother through fatal illnesses.

A constitutional defect in assimilation and a previous low vitality are, of course, recognised as predisposing to all forms of laryngeal inflammation, and it only remains to point out that such a state may be cultivated by 'over-coddling' the body; this being quite as possible in the adult as in the child.

Laryngitis is more frequent in the male sex than the female, and in those of full age than in childhood. On the other hand, as previously stated, the disease is of greater gravity in the child than in the adult. Independently of that most important influence—professional use of the voice—occupation predisposes to laryngeal catarrh in relation to the ventilation of the workroom and the variation in the temperature and other characteristics of the atmosphere, the irritation of chemical fumes, noxious gases, and all forms of dust acting as direct causes. The more detailed observations under the heading of occupation, which were given when enumerating the causes of pharyngitis (p. 249), may be

applied to the affection under present consideration. The same may be said of the influence of alcoholism, tobacco-smoking, and dietetic faults and excesses.

Of the exanthemata and continued fevers which predispose to laryngitis, the principal are measles, variola, scarlatina, and typhoid. In the first-named, laryngeal inflammation may be an early complication of the general disorder. In the others it is a later manifestation, and not unfrequently of a more serious type. The laryngitis of **chicken-pox** and of **rötheln** is always that of the mild catarrhal type. In the former, yellowish flaccid vesicles are seen on a hyperæmic ground, especially on the epiglottis (Fig. 72, PLATE VIII.); when these have broken they appear as excoriations, and resemble, according to Jennings, aphthous ulcers. In rötheln—as in measles—the mucous membrane of both the fauces and larynx partakes of the cutaneous characteristics. Of traumatic causes, irritant poisons, scorching flame, scalding water and steam, are capable of inducing either the œdematous or the mucous form, and provided the effect be quickly counteracted, the inflammation may be of the milder character. With children there is usually membranous exudation.

From the foregoing it will be seen that laryngitis may, both in its acute and in its chronic forms, be considered as either primary or secondary.

PATHOLOGY.—The morbid changes of the laryngeal mucous membrane in simple laryngitis consist, in the first instance, in an active hyperæmia, leading to swelling of the tissues, and resulting in disorder of the mucous secretion. As a rule the inflammation is spread uniformly over the whole of the tissues of the larynx (Fig. 69, PLATE VIII.), degrees of severity depending rather on differences of grade than of extent. But it sometimes happens that an acute catarrh is strictly limited to quite special regions, whilst the rest of the larynx remains to all appearance entirely or comparatively normal (Fig. 70, PLATE VIII.). Thus Turck, Ziemssen, and Stoerck all speak of an *epiglottitis*, an *arytenoiditis*, and a *chorditis* as special affections. These distinctions have also been adopted by Cohen. They are of no particular practical value.

At the commencement of the inflammatory process the secretion is somewhat arrested, and consists of a glairy fluid, rich in leucocytes and mucin, but with few epithelial cells. Later, the secretion becomes more abundant, and contains large masses of epithelial detritus. Before the infiltration causes desquamation of the epithelium, the individual cells become white and opaque, constituting the condition known as *cloudy swelling*. This ap-

pearance is not due to hypertrophy of the epithelium, as occurs in the condylomata plana of syphilis, but is caused by the rapid decay of the new cells generated under increased blood supply, and to granular changes in the contents of the epithelial cells themselves. When in the course of the affection the deeper layers are also thrown off in patches, the red, angry sub-epithelial surface is exposed. Whether it is justifiable to call such erosions ulcers, I will not attempt to decide, although the term is applied by many pathologists to any loss of substance upon a free surface, occurring from a non-traumatic cause. Schroetter, although he speaks of a loss of epithelium in acute laryngeal catarrh, denies the occurrence of ulceration in this affection. It is certain that ulceration extending through the whole thickness of the mucous membrane, as is the case in tuberculosis, syphilis, etc., never happens in simple catarrhal laryngitis. I expressed this conviction in my first edition, and would draw attention in support of the view—adversely commented upon by more than one reviewer, but which further experience has only strengthened—to the fact that Isambert, Mandl, and many other French writers upon laryngeal diseases are of opinion that ulcerations never occur in the larynx, except in individuals the subjects of some specific dyscrasia (tuberculosis, syphilis, scrofula, etc.). The *fissura mucosa* which Stoerck describes must be a rare phenomenon, since it is not mentioned by any other writer, nor has it ever been witnessed in my own practice. He explains that, should an erosion happen at this point—the inter-arytenoid space—it is quite easy to understand how the break in continuity may extend entirely through the membrane, because just in this place the membrane is often infiltrated and œdematous, and, being thrown into folds at each expiration, and immediately afterwards put upon the stretch by the succeeding inspiration, it is apt to yield under this alternate stretching and relaxing; moreover, he argues, this region seems to be the *pars minoris resistentiæ* of the larynx, and is a favourite seat of the destructive processes which invade that organ.

In **children** the morbid process is somewhat intensified, the exudation having a tendency to be plastic or pseudo-membranous, independently of any possible specific infection. Infantile laryngitis is invariably accompanied by considerable spasm and stridor of respiration.

In the laryngitis of **measles** the hyperæmia occurs in patches of varying intensity, and the epithelium is shed irregularly; these modifications partaking of the cutaneous characteristics of the primary affection. Erosions are more common than in uncom-

plicated catarrhal laryngitis, and (rarely) small ulcers are formed. Membranous exudations occasionally occur in severe cases. But these are not truly diphtherial, as determined by a bacteriological examination, although a larynx inflamed during the course of measles presents a receptive culture ground for diphtheria of a most malignant type.

Laryngitis is a very frequent event in the course of **variola.** In mild attacks of the primary disease the inflammation may be of the simple form; but in exceptional cases very serious laryngeal complications may arise, in the shape of pustules, hæmorrhages, abscesses, fibrinous deposit, and perichondrial changes, with œdema, ulcerations, and caries. Diphtheria as a complication or sequel of the laryngitis of small-pox is exceedingly rare. Occasionally there is a fixation of the vocal cord from anchylosis of the crico-arytenoid articulation, but a true muscular paralysis, comparable to the post-diphtherial variety, as a matter of practical experience, does not exist.

Laryngitis in **scarlatina** is rare, and especially so in view of the frequency of pharyngeal complications. The laryngeal inflammation may be of moderate grade, and of the simple form, represented by slight hyperæmia; in a more serious case there will be also infiltration, while in the worst forms of *scarlatina* the laryngitis partakes of the pseudo-diphtherial character manifested wherever the septic influence of these specific fevers is exerted with malignity. Implantation of diphtheria upon a scarlatinal laryngitis is a comparatively frequent event. When renal complications arise, the laryngeal condition is often of the nature of acute œdema, and this may occur weeks or months after recovery from the fever.

It is common for the larynx to be more or less inflamed in cases of **erysipelas** of the face and head, but, according to Ziemssen (quoted by Lincoln), although there may be slight œdema of the ary-epiglottic folds, among several hundreds of cases of erysipelas of the face and head, he has not seen a single instance in which the laryngeal stenosis was at all alarming. Quite otherwise is it when phlegmonous pharyngitis—not uncommonly associated with cervical cellulitis and erysipelas—extends to the larynx. The condition is here most alarming, for to the dysphagia due to the pharyngeal infection is added suffocative dyspnœa. Massei also speaks of a *primary* erysipelatous laryngitis, but it is rare.

Laryngitis usually occurs as a late—probably also as a *secondary*—manifestation of **typhoid fever.** It may be of the

simple or the œdematous variety. In many cases the lesions depend upon the influence of diathesis. The chief characteristic is the strong tendency to active ulcerations, these principally occurring on the ventricular bands; for, though all portions of the larynx may be attacked, it is important to note that in laryngitis associated with the infectious fevers, and especially typhoid, the lymphoid elements of the larynx are not only specially prone to be attacked, but that they share the same morbid changes which occur in the visceral lymphoid structure, *e.g.* Peyer's patches.

In these diseases also perichondrial changes of the gravest character occur. Paresis of the laryngeal muscles has been noted by Lublinski as a complication of typhoid fever.

Laryngeal inflammations in connection with **typhus** are more rare. The lesions vary from dusky red congestions to œdema with pseudo-diphtherial or purulent deposit, and ulcerations which may become gangrenous. More or less distinctive features are to be observed in the laryngitis which is seen in **influenza**, **relapsing fever**, and **malaria**, but these need not here be detailed. Simple mention may be made of the fact that in **acute glanders**—a disease of which I have seen [illegible] example—the pharyngeal manifestations [illegible] abscesses breaking down into large and [illegible] extend to the larynx [illegible]

Symptoms.—**Functional.** [illegible] the **voice** is altered [illegible]

mation is becoming complicated by the more serious condition of œdema. The character of the dyspnœa of laryngitis is mainly one of spasm, inspiratory prolongation, and stridor; these generally decrease as mucous expectoration occurs. In **children** the respiratory symptoms are much more severe, and in some cases are the first evidences of the attack. They present all the spasmodic characters of inflammatory—non-membranous—croup. The paroxysms, as in all croupous attacks, generally occur at night, the children awaking from sleep with violent cough, stridor, and all the other sensations and appearances of suffocation. After a time the spasm subsides, and the little patient falls into an uneasy sleep, to be again aroused after a varying interval by a repetition of the alarming and distressing symptoms. **Nasal respiration** is nearly always interfered with by co-existent hypertrophic conditions of the turbinated bodies or septum, or by adenoid growths.

Cough is by no means a constant symptom, and is often limited to efforts at expulsion of the supposed cause of the uncomfortable sensation of dryness, itching, and irritation of the larynx, which is an early and frequent symptom; when it exists in a more pronounced form it indicates lodgment of secretion at a 'cough spot,' or it may be the result of extension of the inflammation to the lower pharynx, which gives rise to irritation of the posterior wall of the larynx and trachea. The cough of laryngitis, when severe, has a characteristic metallic stridulous sound in the earlier stages; while later its tone partakes of the vocal changes peculiar to the case, and may be hoarse, aphonic, high- or low-pitched. As mucous exudation occurs, the spasmodic character subsides, and the cough becomes loose and moist. Although frequently violent, the cough of larnygitis is not often painful in the **adult**, but it is distressingly so in the case of **children**; the little patient will cry with the pain during an attack, and may be seen to seize his neck as if to prevent it being torn by the violence of the expiratory effort to dislodge the tenacious secretion.

The *expectoration* in **adults** is at first scanty and clear; freer and of mucous character in the early stages of subsidence. Frothy, muco-purulent, and abundant expectoration gives evidence that the inflammation is extending to the bronchi. Expectoration in **children** is always scanty, and it is probably on this account that the paroxysms of cough are so much more severe and prolonged.

Deglutition, unless the laryngeal attack is complicated with pharyngeal inflammation, is not often affected. In other

circumstances, if food be taken unduly hot in temperature, there is not infrequently a distinct uneasiness experienced, as it impinges on the epiglottis or against the arytenoids, on entry to the gullet.

Pain is a symptom of very varying intensity in **adults**, but does not always correspond to the degree of inflammation. At first the sensation is one of irritation, tickling, or burning within the larynx, soon to be followed by a feeling of tightness and constriction. External tenderness on touch is not, in my experience, a frequent accompaniment of catarrhal laryngitis. In **children** pain is more constant and more severe.

B. **Physical Signs** are to be observed with the laryngoscope. **Colour** is always increased, as would be expected where there is intense capillary hyperæmia; but the shades of coloration greatly vary, according to the intensity of the attack. The vocal cords are often the last parts to be changed in colour, and may have a normal appearance, with even a high degree of inflammation in other parts. Sometimes, on the other hand, they are, from the first, more or less red, or they may become almost purple, and assume a deeper hue than any other part of the larynx. In laryngitis of the exanthemata, an eruption similar to that on the skin is often visible in the pharyngo-laryngeal region (Fig. 72, PLATE VIII.). **Form** is not often greatly altered in catarrhal laryngitis, the only parts liable to change by tumefaction being the ventricular bands. These may be swollen to such an extent as to quite obstruct the view of the cords. The epiglottis may lose its sharp outline, but it is seldom much thickened except in laryngitis from traumatic causes, when it is often swollen.

Ziemssen has drawn attention to the fact that, independently of the inflammation, the laryngeal image is influenced by the particular character of the muscular paresis. The most usual varieties are those delineated in PLATE XIV., Figs. 127 and 128; and again reproduced on the next page. The first (Fig. CCXIV.) is due to impairment of the thyro-arytenoidei interni, with resulting imperfect tension of the cords; the second (Fig. CCXV.), to paralysis of the arytenoideus transversus, which gives rise to a gaping of the cords at their posterior portions. The arytenoid cartilages, and with them the posterior parts of the vocal cords, may also be prevented from approximating, by swelling of the mucous membrane of the posterior glottic commissure, as seen in Fig. CCXVI.

Surface Texture is, as indicated when discussing the morbid anatomy, liable to be roughened by separation and denudation of the epithelium, leading to erosions; but true ulceration is rare.

In the laryngitis of the exanthemata, the continued and other fevers, there are certain surface changes characteristic of the primary affections, superadded to those due to the inflammation. These have been already described.

Secretion, at first entirely arrested, afterwards becomes excessive, in the form of clear effusion of mucine. This, as the case progresses, increases in quantity and changes in quality, being poured out as mucus or muco-pus.

C. **External.**—Only occasionally is tenderness or pain experienced on palpation, and external inflammatory alteration in form or colour is comparatively rare; nor are the neighbouring glands, though sometimes painful, often enlarged in simple laryngitis.

When, as in young children, a satisfactory laryngoscopic

CCXIV. CCXV. CCXVI.

FIG. CCXIV.—PARALYSIS OF THYRO-ARYTENOIDEI IN LARYNGITIS.
FIG. CCXV.—PARALYSIS OF ARYTENOIDEUS IN LARYNGITIS.
FIG. CCXVI.—IMPERFECT APPROXIMATION OF VOCAL CORDS IN LARYNGITIS, DUE TO SWELLING AND PUCKERING OF INTER-ARYTENOID TISSUE.

examination cannot always be made, introduction of the finger into the larynx has been recommended as an aid to diagnosis; but such a course is to be deprecated, and in any circumstance should be employed sparingly. In every instance laryngoscopic examination should be attempted; and it is surprising how much aid even a very slight view will offer towards forming a correct judgment; especially will it be so where there is the least reason to suspect the presence of false membrane.

General.—An attack of acute laryngitis seldom occurs without premonitory chill, and is almost always ushered in by general febrile symptoms, the pulse being frequent and strong, and the temperature increased. In many cases loss of voice and a general sense of discomfort in the throat are the first indications of an attack.

Commemorative.—There is frequently a decided family

predisposition to attacks of catarrh, though the manifestation may not be always laryngeal. The parents of many patients will often be found, on inquiry, to have themselves suffered in early life. Previous attacks render the patient liable to a recurrence of the malady, the main causes of which liability have already been discussed.

DIFFERENTIAL DIAGNOSIS.—This is not difficult if the laryngeal mirror be employed; the only diseases that can be compared with acute laryngeal inflammation being laryngismus stridulus and diphtheria. Mistakes in diagnosis are more probable and excusable in the case of children than with adults.

PROGNOSIS, COURSE, AND TERMINATION.—The forecast of an acute catarrhal laryngitis is always favourable, so far as life is concerned; but the sudden character of an attack often gives rise to a not unwarrantable fear that the disease may take on a graver character. When an accurate diagnosis is made, and treatment adopted early, the attack is often entirely subdued in four or five to ten days. But too frequently, however, the gravity of the malady is not recognised, and the disease drifts into a subacute stage, and thence becomes chronic. This is especially liable to occur when contributory causes, such as nasal obstruction, improper voice production, alcoholism, etc., are overlooked.

A simple laryngitis may extend to the trachea and bronchi, or it may, under certain conditions, especially when manifested as a secondary complication of one of the specific fevers, take on the more severe form of acute œdema.

TREATMENT: **General.**—In all cases I advise administration of a calomel purge at the commencement; and when the pulse is full I push this drug steadily, both by internal administration in small and frequent doses, combined with James's and Dover's powders, and by inunction with mercurial ointment. In adults, after the purge, tincture of aconite in one-drop doses is of great value (Form. 87). Emetics are not recommended, but both in the adult and the child small doses of antimony, with ipecacuanha and saline febrifuges, are of service. The pouring out of secretion which represents the next stage may be favoured by mild expectorants (Form. 99 and 95). Ice and ice-drinks are very agreeable to some palates, while in other cases warmed emulcents are preferred. Cough, if troublesome, should be checked by opiates. These are better administered in very small quantities —mj. to miij. of a solution of morphine, repeated with frequency, than in larger doses at longer intervals. Opiates must only be given to children with great care.

Locally, everything should be done to remove those conditions favourable to the causation of the disease. For this purpose the room must be kept at an equal temperature of not less than 65° F., be shielded from draughts, and charged with steam. In the case of **children,** steam from a kettle, or a Lee's inhaler (p. 147), playing near to the bed-head, or wrung-out hot flannels hung in the same situation, will aid this end. In the **adult,** the frequent inhalation, from an apparatus causing the least effort, of steam combined with volatile ingredients of a soothing or anodyne character, should be constantly employed. Benzoin, chloroform, conium, and hop, are the best remedies for this purpose (Form. 27, 28, and 29). Counter-irritation by blisters or blistering fluids, depletion by leeches, and the internal application of caustic solutions, are all excluded from my practice. Poultices and compresses are soothing, but are superseded by the application of continuous cold by means of the Leiter coil (p. 157). Topical remedies, in the shape of insufflation or solutions, to be applied by the surgeon, are seldom necessary, or even advisable. Gottstein, with reason, makes an exception 'in those cases in which, early in the disease, a paretic condition of the cords exists, and in which the aphonia is out of proportion to the swelling. Here the stimulation produced by the insufflation of a powder, composed of equal parts of alum and sugar of milk, or by painting once (with an astringent), is sufficient immediately to remove the aphonia; there afterwards remains a slight huskiness, due to the injection of the vocal cords, which usually disappears without any further treatment.' Finally, in all cases where there is intra-nasal or naso-pharyngeal disease, the affected areas must receive appropriate treatment for the reduction of congestion and obstruction—the one by menthol-sprays and ointments, the other by the cautery. The rapid cure of many cases of laryngitis by remedy of these conditions alone, will be nothing less than a revelation to those who have treated the affection on the old lines.

Dietetic and Hygienic.—There is nothing particular to be said with regard to the dietetic treatment of acute laryngitis. The administration of stimulants *may* be necessary if the strength is failing, but is not often employed in my own practice.

Hygienic treatment during the attack is of the greatest importance, and no chance should be given, by exposure to draughts, for the recurrence of those relapses, the liability to which is so great.

For many weeks, indeed, caution must be exercised with reference to night air, heated atmospheres, much use of the voice,

and sudden changes in clothing. Seeing how frequently tuberculosis takes its origin from an acute inflammatory attack, as well as from neglect of chronic inflammation, it behoves the practitioner to watch the patient carefully till all functional and physical signs of inflammation have subsided, and not to hesitate, if necessary, to recommend change to a more genial climate.

The prophylactic indications against recurrence are of a totally different nature in the case of patients in whom an attack has been induced, either by over-care of themselves, or by enforced confinement in an impure atmosphere. In such, gradual education of the body and of the respiratory passages to more invigorating influences and to a freer indulgence in open-air exercise will be naturally suggested.

In the case of public speakers, clergymen, and singers, complete rest of the voice should be rigorously enjoined until recovery is complete, and permission to resume its use should be withheld until the surgeon has satisfied himself that it is employed in obedience to right physiological principles of production. By observance of this hint, recurrence in the professional class most liable to laryngitis may more surely be prevented than by any drug or hygienic measure.

2. Subacute Laryngitis—The Laryngitis of Singers.

In considering the course and progress of acute laryngitis it has been stated that the affection seldom presents symptoms of vital danger; and it has only to be added that there is a form of acute laryngeal inflammation very commonly seen in professional voice users, which is recent in character and presents true evidences of inflammation, above and beyond that of mere hyperæmia, but which is, nevertheless, subacute in intensity. There is no necessity to go over the whole ground of the pathology, symptoms, and treatment as just detailed, further than to say that while the morbid conditions, functional and physical signs, and therapeutic measures of the graver malady require to be modified in the milder inflammations, the caution must be added that neglect of a subacute catarrh of the larynx may easily lead to a serious inflammation, or to the persistence of the catarrh in the chronic form.

This appears an appropriate place to offer a few remarks on the vocal troubles of singers which represent for the most part departures of the normal tone of a subacute grade. What follows must be taken as a concession to a growing desire on the part

of practitioners for information as to treatment of throat affections of those in whom the slightest variation of functional health may at once destroy the charm of a great gift, and perhaps inevitably ruin the reputation and even the career of its possessor. The reason why this question has not been separately treated in previous editions is that I have always held that there is little of pathological distinction between the throat diseases of the professional voice user and of the ordinary individual, and my opinion is unchanged on this point. Nor is there any clinical difference of importance, and the predominant factor is simply one personal to the individual, by no means confined to the vocal apparatus as a whole, and far less to the larynx, in which are placed the elements essential to the production of musical tone. In other words, purity of voice demands, in the first place, a most rigid obedience to the laws of health and personal hygiene, and, secondly, to those which bear on voice-production, in their special application to the lyric and dramatic arts.

We have seen that the larynx is involved in but a small proportion of diseases of the throat, and, as I have long pointed out, this is especially emphasised in the case of voice users; and that faults in method, responsible as they are for so many vocal troubles, are but rarely accentuated in the vocal cords. It is, indeed, a universal experience that the finest singers are those who suffer least and who longest retain their vocal powers. It is important to enforce this view, because, in recent days, it has become the fashion to look for, and even to discover, some morbid change in the cords of almost every singer who seeks advice, and thus the laryngoscope, instead of proving, as it so often legitimately may, of encouragement to the patient, becomes a weapon of terror, serving only to increase that self-consciousness and unfounded fear of a permanent breakdown which appear to constitute an inseparable characteristic of the lyric artist. We have already seen how that nasal obstruction is a predisponent factor in the production of a voice user's pharyngitis, and that this in turn is often due to some fault in production or abuse of the voice. Some of the causes of these faults and their pathological results have been indicated in other parts of this book, and there is no occasion to repeat them.

Confining further remarks to more purely laryngeal troubles attention may, in the first instance, be drawn to the fact that the human larynx is constructed for speaking and conversation, and not for singing, unless under special education. The singer's

larynx, therefore, being highly trained is, in accordance with a general law, more highly susceptible to be affected by slight causes. We thus see that individuals who use both the speaking and singing voice professionally are liable to fail, and that the failure is most pronounced in that portion of the voice which calls for finer muscular adjustments. We also observe in the second rank of singers that dancing, rapid movement, and much gesture, have an injurious effect on the voice, and this may be at once the reason and the excuse for the tame acting of many fine singers; on the other hand, it is the explanation of the early breakdown of some of those voices which are called 'dramatic.' For not altogether dissimilar reasons we can understand why choir singing, choir training and teaching, are calculated to mar excellence in solo singing, and it may be added to predispose to some diseased conditions. Again, as has been already remarked (p. 104), the vocal cords of a singer, especially in their cartilaginous portion, are often unduly hyperæmic, and not a few whose singing voice is pure exhibit a degree of hoarseness in conversation. Krause in a recent paper states as a clinical fact that at the onset of a **cold in the head** a singer's voice will often be remarkably fine, but he does not offer any pathological explanation of the circumstance. But this is easy, for at the commencement of every attack of acute rhinitis there is an excess of mucous secretion; and this condition of increased moisture explains why the vocal tone is enhanced. Nevertheless, a penalty is invariably paid by the singer who fails to rest the voice on the first warning of a cold. The great importance of the finer adjustment of the free edges of the cords in the act of singing is the reason why a quite slight inflammation, which would be unobserved in the conversation of ordinary persons, would seriously affect the purity of the singing voice. It follows that while some latitude may be given to the voice user as to continuance of exercise of his art, in the case of a catarrh affecting the nose, pharynx, or fauces, orders to rest must be peremptory whenever the larynx is in the least degree implicated.

A very common complaint of the singer is an actual **extinction of singing voice,** that of speaking being unimpaired. This is almost invariably due to a dry catarrh affecting the larynx and the larger bronchi. It is felt especially in production of the head and falsetto tones, and in the inability to sing *mezza voce* or to execute *fiorituri.* Nor is this *abaissement de voix* only to be seen in connection with cold and damp. It is an especial characteristic of very hot weather, and may then be due—(1) to

exhaustion, (2) to the irritation of dust and pollen-laden atmospheres, or (3) to a chill from a *courant d'air*, liability to which is greater in the summer weather than in the winter. The noxious effects of bicyle exercise may be explained under these last two heads. The condition, whatever the cause, is only relieved on restoration of mucous secretion, which is best achieved by the oft-repeated administration of expectorants in small doses. The remedies I employ for such cases are an expectorant pill (Form. 95), made according to a favourite prescription of the late Dr. Billing, or minute doses of antimony and ipecacuanha (Form. 99), to be followed promptly on reaction by a tonic expectorant (Form. 90); or a nerve tonic such as strychnia. Constipation due to insufficient bodily exercise being habitual to most lyric artists, a preliminary searching purge is often an essential; employment of a wet compress over the larynx, with or without iodine (Form. 81), is a valuable local adjuvant. A very slight catarrh, representing a comparatively slight change in the laryngeal secretion, will affect the singer; in these instances there will often be seen a small pellet of more or less agglutinated mucus forming a minute bridge between the cords, and this is generally seen at about the middle third, a point of common site for slight nodal swellings as also for laryngeal papillomata. There can be little doubt that **'singers' nodules'** rarely occur except in individuals who sing wrongly, or excessively; and one of my patients of great eminence is aware of this circumstance, and treats himself by a period of repose or by ceasing for the time being to sing operas which make excessive calls on the powers.

The public have an idea that the indisposition of an artist to sing is often due rather to capricious or fanciful causes than to real disability, and it is certainly true that in many instances I have been unable to detect any visible, far less any gross lesion in the vocal apparatus. Notwithstanding, I have never declined to endorse by certificate the artist's sense of inability to appear. In some of these cases the laryngeal voice may be perfect but the tone is impaired, and when this is so the general rather than the local health requires treatment.

It must always be remembered that as a rule the singer has everything to lose by not appearing, and it is possible that refusal on the part of the doctor to give a certificate may occasion him some annoyance. The following circumstance is related as possessing something more than anecdotal interest:—

CASE LXXIII.—In the early seventies, Signor V., the conductor of the Royal Italian Opera, brought a tenor singer to me for the purpose of examining his throat, and

of deciding whether he was in a condition to make his début that night in 'William Tell' as had been arranged.

Every part of his vocal apparatus was found to be in perfect health, and that there was no physical hindrance was proved by the patient shouting a high C in a manner somewhat habitual to him. The patient was, however, very nervous, and in spite of my assurances that he need not fear for his throat, an old operatic campaigner of thirty seasons, who was also present at the interview, prophesied to me a breakdown so soon as he appeared on the stage; and this indeed occurred, the new singer failing on almost his first note.

The next day I was threatened with an action for conspiring with the conductor to bring about a *fiasco*; but happily wiser counsels prevailed, and the singer retired for a time into private life.

A frequent evidence of the increased sensitiveness of a singer's throat is the great liability that is manifested to the noxious influences of **theatre sanitation,** the effect being always much more marked in the *prima donna* than in the chorister.

The practitioner is often asked to prescribe something to brace up the voice for a performance, or for some specially trying call. I am not in favour of such remedies, holding strong views on the inadvisability of supplying force at the inevitable cost of precision, and the reactionary weakening after undue stimulation. The wines of coca and kola may be permitted with the strictest injunctions against their habitual use; and still more exceptionally, a small dose (♏ v.) of laudanum with ♏ xx. of ether will be found effectual for a special emergency such as I have indicated. It should be taken about ten minutes before the call, and not more than one dose should be allowed during the same concert or performance.

A few final words may be said as to **surgical treatment** of a singer's larynx. Notwithstanding that Labus, of Milan, has recommended the absolute flaying of an inflamed vocal cord, and Krause advises deep scarification, great caution should be exercised by the surgeon in performance of any intra-laryngeal operation whatever, except by those whose position is so assured as to make them indifferent to blame or ingratitude should the treatment not achieve all that may be desired. That such active or indeed any local treatment is not absolutely essential is proved by the fact that the world's greatest *prima donna*, who has sung close on fifty years with perennially recurrent freshness and charm, has never allowed her larynx, or even her fauces, to be either brushed or sprayed.

On the other hand, however convinced the laryngologist may be that a vocal failure is due to some fault in production, it is hardly within the scope of his duties to prescribe—far less to formulate—vocal exercises. At any rate, such a one is in no

position to protest against a rather besetting tendency of teachers to encroach on the province of the doctor by giving their pupils prescriptions for pharmaceutical remedies and *nostra*.

3. Chronic Laryngitis.

Synonym.—Chronic laryngeal catarrh. (Figs. 71, 73, and 74, Plate VIII.)

Laryngitis chronica, by far the most frequent form of laryngeal disease with which the specialist has to deal, differs widely from the acute inflammation, both in its pathological and clinical aspects. The condition may occur as the sequel of acute inflammation, or it may be exhibited from the first with all the chronic manifestations which characterise it. In such circumstances it is often an extension of a similar variety of pharyngitis. In fact, the two are most frequently found in association, and are often the result of mouth-breathing induced by **nasal stenosis.** There is, moreover, a form of laryngeal hyperæmia, occurring especially in professional voice-using subjects of catarrhal disposition, which is so slightly remittent as to be essentially chronic.

Etiology.—The diathetic and atmospheric causes of chronic laryngitis are essentially those which produce in some people naso-pharyngeal catarrh, and in others chronic pharyngitis, with the addition that in the laryngeal affection excessive use of the voice during the catarrhal exacerbations naturally acts more injuriously on the vocal organ. This condition is especially common in those who not only use their voice at all times and seasons, irrespective of their state of health, but who, when they speak, 'do not mind their stops.' It is, therefore, common in extempore preachers, and especially in those who allow themselves to become greatly excited, and to violently gesticulate during their harangues. Continued use of the voice in boys during the 'cracking' or 'breaking' at puberty, is liable to render permanent the inflammation always present during this period of change.

Excessive smoking is undoubtedly an exciting cause of chronic congestion, and is especially so recognised by French laryngologists, who describe at length certain appearances peculiar to 'la gorge des fumeurs.' Increased experience has assured me that the use of tobacco has a much more obnoxious effect on the larynx than I formerly believed; but I am still of opinion that its ill-effects are, in many cases, confined to the pharynx, where it is particularly harmful to those who while smoking indulge in

frequent expectoration. So far as the larynx is concerned, that organ is affected only in as much as it is a portion of the respiratory tract; this is equally true of the influence of other impure atmospheres, such as those in which miners, knife-grinders, millers, and masons are obliged to work. Occupations which necessitate working in an atmosphere charged with noxious particles are not thought to greatly determine laryngitis in its chronic form; they probably predispose to more serious disease.

The habit of taking 'chasses' of cognac, absinthe, and other liqueurs, tends to produce congestion and inflammation of the epiglottis, and this may extend into the other parts of the larynx. Without doubt the victims of chronic alcoholism, especially when spirit-drinkers, suffer very frequently from chronic laryngitis. In both smokers and topers, the mode of the inflammation is twofold; first, by paralysis of the vaso-motor control, and secondly, in the case of drunkards, as suggested by Gottstein, from accumulation of the profuse mucus—characteristic of alcoholism—which, dropping during sleep from the pharynx into the larynx, sets up irritation in the air-passages. That the power of alcohol to cause chronic laryngitis is due in some measure to local causes, is evidenced by the fact that the same condition may be witnessed in wine-merchants and wine-tasters, who, notwithstanding their occupation, may be very temperate in drinking and careful not to swallow the fluid. Chronic laryngitis is not infrequently witnessed as a sequel of measles and other exanthemata, even in cases in which acute laryngeal inflammation may not have been manifested.

The presence of morbid growths *within* the larynx is also asserted to be a cause of this disease, but it might more properly be classed as an effect. When, however, enlarged bronchial glands or other *external* tumours exist, and cause pressure even to a slight degree, laryngeal hyperæmia is frequently found.

Patients of the arthritic diathesis, and also those liable to hæmorrhoids and other affections due to congestion of the portal system, frequently suffer from catarrhal laryngitis.

It is a moot point as to how far an elongated uvula may be responsible for the production of chronic laryngeal inflammation, but it is suggested that the two conditions may be simultaneously or successively produced by the same exciting cause, which is usually hypertrophic nasal catarrh. There can be no doubt that chronicity of laryngeal inflammation is sometimes due to uvular irritation.

The disease is essentially one of adult life, and is naturally,

having regard to the circumstances favourable to its causation, more frequent in males than in females.

PATHOLOGY.—This affection is marked by permanent dilatation of the vessels, due to a long-standing hyperæmia, by hypertrophy of the mucous membrane in all its layers, and by a change in mucous secretion. The acino-tubular glands and the groups of lymphoid tissue especially partake of the general hypertrophy, and give to the membrane a granular appearance—*laryngitis granulosa*, otherwise called *follicular laryngitis*. Tobold reports a case in which the hypertrophy of the ventricular bands was so great as to obliterate the pouches of Morgagni, and to conceal entirely from view the true cords. Such a grade of thickening is, however, comparatively rare, and seldom occurs in simple catarrh. It is well known that in chronic blennorrhœa and in the throat affections of typhoid patients the mucous membrane is sometimes seen to be thrown into such thick, heavy folds as to render the larynx almost unrecognisable. Lewin states that such a condition is not unusual in the chronic sore throat of preachers and criers.

Türck first described and figured a peculiar form of chronic inflammation limited to the vocal cords. This he often observed in professional singers. He has named it *Chorditis tuberosa*. A number of cases have occurred in my practice in which the appearances agreed exactly with the description given by this author. Whilst the other regions of the larynx seem quite normal, the cords are of a yellowish-red colour, and upon their superior surfaces, usually near the free margins, appear little white tumours or granulations about the size of a millet-seed. These constitute, in point of fact, the much discussed 'singers' nodes.'

According to the experience of Mandl, the inflammation in chronic laryngitis is commonly seen to be confined to the arytenoids and vocal cords in singers and orators, and to the epiglottis and ary-epiglottic folds in drinkers and smokers, an experience with the first portion of which I entirely agree. In advanced cases of alcoholic laryngitis, if the term may be used, the hyperæmia and thickening are general.

Erosions, chiefly upon the cords and between the arytenoids, are much more frequently met with in chronic than in acute catarrh. They are usually small in extent, and circular in shape. Such loss of epithelium is not readily noticed, except by the experienced laryngoscopist, who recognises this condition not so much by the change in colour as by the absence of that

peculiar sheen which the epithelium, covered with mucus, lends to these parts in the normal larynx. Catarrhal erosions heal readily by quick regeneration of the epithelial cells, and the loss of substance never extends beyond the superficial layer of the true mucosa.

This appears an appropriate place to consider the condition long recognised, but only recently described, as **pachydermia laryngis.** This is a term which may be applied to that degree or form of chronic laryngitis which is characterised by progressive thickening of the surface cells and exaggeration of the subepithelial connective-tissue elements, changes which seem to be associated with a dry catarrhal process not limited to any particular dyscrasia, and exhibited most prominently in the posterior commissure and in the cartilaginous glottis. The favourite site for this infiltration is in the posterior commissure or inter-arytenoid fold; the deposit may also involve the cartilaginous portion of the vocal cords.

SYMPTOMS: A. **Functional.**—In chronic laryngitis the **Voice** is, as a rule, constantly hoarse; the amount of dysphonia, however, varies considerably, according to the degree of inflammation of the cords, and also with functional rest or exertion: under injurious influences there may be complete aphonia. Food-taking will often improve the voice; and another factor in determining variation in functional purity is the time of day. Thus a patient will rise with the throat dry and with distinct hoarseness. After breakfast the voice may be comparatively clear, to become again quite hoarse after some hours of use, or as the effect of bodily fatigue. If the patient is a singer, the vocal injury will be manifested by loss of range, diminished endurance, and want of control. As the disease advances, all vocal efforts will be obviously strained and laboured. Want of co-ordinative control will be also a prominent and progressive feature.

Respiration is seldom embarrassed, but the respiratory act becomes less complete, so to speak, on account of the fatigue of the glottis. In the act of phonation, therefore, the vocal cords are not set in action by full bellows-power, and breath-taking during speech becomes frequent and gaspy. **Nasal respiration** is usually impeded, being indeed a frequent antecedent.

Cough is a frequent but by no means constant symptom, unless the catarrh has extended to the trachea and bronchi. It most often occurs on rising in the morning, on change of atmosphere, on use of the voice, or under any circumstances liable to cause the dislodgment of mucus in the air-passages. The cough is soft and moist when the mucus is excessive, but ringing and metallic in advanced cases, in which the scanty and tenacious

secretion has rendered the cords harsh, and has crippled muscular and articular movements.

Pain.—Except in the effort of vocal exertion or after fatigue, there is rarely true pain. There is, however, a constant feeling of constriction, or a sensation as if there were a foreign body in the air-passages. When the uvula is elongated, direct irritation due to this cause may play some part in giving rise to the sensation.

B. **Physical.—Colour.**—The hyperæmia of chronic laryngitis is by no means uniform. Either one or both cords may be affected, and this either in their whole length or in their cartilaginous portions only. In the latter case the vocal process of one or both sides will be seen to stand out as a comparatively white prominence: the other parts of the larynx are congested in proportion and frequency to the closeness of adhesion of the mucous membrane to the subjacent tissue; namely, the epiglottis, the cartilages of Wrisberg and of Santorini, and the ventricular bands: and they are usually affected in the order named.

The capillary vessels of the epiglottis are often seen to be in a state of varicose congestion, similar to those of the posterior wall of the pharynx in chronic pharyngitis. A case in which there was a similar condition of the vocal cords and ventricular bands has been described by Morell Mackenzie, and has been termed by him *Phlebectasis laryngea*. It is exceedingly rare, and hardly merits the dignity of being considered as a separate disease or variety, but it may represent a form of laryngeal varix, to which Lewin in 1863 first drew attention, describing a case in which the hyoid fossa was the site of the manifestation.

Form and Texture.—Although there may be swelling of the mucous membrane, especially of the looser portions, absence of submucous thickening is a marked characteristic of chronic catarrhal laryngitis, to which may be added immunity from ulceration. The epiglottis is the only part likely to be at all thickened; this is especially the case in the laryngitis of alcoholism.

There is commonly relaxation of the inter-arytenoid fold and of the ventricular bands, and the vocal cords are often seen during phonation to have lost co-ordinative power, and to be spasmodic in action, giving a jerkiness of movement.

Very rarely indeed there may be slight erosion at the vocal process (Fig. 73, PLATE VIII.), *i.e.* at the situation where friction may be exercised; but such a symptom should be looked on with the greatest suspicion of deeper mischief. Another situation for

erosions is the inter-arytenoid fold, the *fissura mucosa* of Stöerk. The follicles of the larynx are sometimes enlarged and prominent (Fig. 74). Some writers, then, consider the disease as a separate variety, viz. follicular laryngitis, or glandular laryngitis.

My opinion on this point is the same as that enunciated concerning varieties of chronic pharyngitis, viz. that all forms, being due to one pathological cause, should be considered as variations in degree and not of kind; but when there is any distinct enlargement of the racemose glands, and especially if there is superadded erosion, however slight, of the vocal cords, the practitioner should search carefully for signs of general phthisis, and make a bacteriological examination of the laryngeal secretion. Comparison of Fig. 73 in PLATE VIII., and of Fig. 93 in PLATE X., will show how enlargement of the glandules may be but a first step towards tuberculous ulceration. I entirely agree with Gottstein, who says that it is doubtful whether the small red points sometimes seen on the vocal cords in chronic catarrh bear any analogy to glandular pharyngitis, and for one reason, because, as is well known, such glands are entirely absent from the upper surface of the cords. This author's suggestion, that these red points are to be considered as papillary enlargements, which, under certain circumstances, may give origin to polypi, is also one of great probability.

Mobility of the vocal cords is often impaired, both from mechanical obstruction to articular action and from slight muscular pain. The changes in this direction are usually, but not uniformly, bilateral.

Secretion.—This may be abundant or sparse: it is almost always excessive in the earlier stages, but often becomes gradually arrested as the disease advances, so that the throat is felt and seen to be always dry. The character of the secretion is generally that of a gelatinous accumulation, with viscid, tenacious mucus, clinging about and around the laryngeal orifice, and collecting in thick pellets upon the cords and in the ventricles. The little bridges of mucus stretching from cord to cord, which are seen during phonation, are almost in themselves sufficient to differentiate a chronic from an acute catarrh.

C. **Miscellaneous.**—External examination gives but negative results, though the surgeon's attention is often drawn by the patient to a supposed swelling. When any glandular enlargement is present, there is strong reason to doubt the simple nature of the complaint. The general health suffers in very varying degree; this variation depending much upon the importance of the loss of

voice to the material well-being of the patient, and the consequent effect on his nervous system.

The digestive system is frequently disturbed, causing loss of appetite and dyspepsia. Worry and mental anxiety will often produce sleeplessness and even emaciation. Careful examination of the lungs should never be omitted in any case of chronic laryngitis, especially when there is persistent swelling of any part of the mucous lining, or when there is ulceration.

PROGNOSIS, COURSE, AND TERMINATION.—Recovery from this disease is always slow, and greatly depends upon the amount of obedience to the practitioner's directions, and the perseverance with which these are carried out.

The great cause of anxiety is the fear of a simple catarrh running into the tuberculous form. On this account the prognosis should be guarded, especially if there is the slightest tendency to phthisis in the patient's family. In cases of goitre there will often be a marked exacerbation on the recurrence of the menstrual flow.

As a rule, with persistence of treatment, these cases do well. When, however, the catarrhal predisposition is strongly marked, the tendency to relapse is great. In many instances the baneful cause will have produced so much mischief, that the voice will, in spite of all treatment, remain hoarse. This is especially the case when the disease is due to chronic alcoholism, and when abuse of the voice has been very exaggerated. Vocalists, if they regain their voice, but too frequently find that the range is diminished and the tone-quality impaired.

TREATMENT: **General.**—Constitutional remedies are not of much service, though attention to the digestion, diet, and general powers of the patient is of decided importance.

In many cases where the mental anxiety has almost gone the length of hypochondriasis, bromide of potassium has proved of great utility in my practice. In other cases a 5-grain dose of hydrate of choral, two or three times a day, has an admirable effect in calming the mind. When there is portal congestion, a natural saline purgative draught each morning is beneficial. In glandular enlargements and goitre, iodide of iron and other suitable remedies must be given, and cod-liver oil will also be indicated where there is any sign of general emaciation.

Local. — Local measures must be directed to favouring resolution. First amongst these are vapour inhalations of a stimulating character. Benzoin with pine oil, benzole, creasote, and pine oil, or pine oil with camphor, are the best; the first

being the mildest, the others successively stronger in stimulant action (Form. 29, 30, 32, 37, and 38). This list of stimulating inhalations is quite long enough for all practical uses. Obstructions in the nose, so frequently present, are to be radically removed; for mere palliation will not lead to complete cure or protect against recurrence.

Lozenges, whether the pharynx is or is not affected, are also of great benefit, those in Form. 12, 15, and 19 containing astringents, together with sialagogues and expectorants, being the best adapted to fulfil the various indications. When pharyngeal disease co-exists, the treatment of such a condition is of primary importance, and very many cases of laryngeal congestion will get quite well with but little further treatment when the co-existent disease higher up has been cured.

The use of local astringent solutions is of decided value, especially when there is congestion of the vocal cords, arytenoid cartilages, or inter-arytenoid folds. Such solutions should be of very moderate strength; the most generally serviceable is that of chloride of zinc, 10 to 30 grains to the ounce of water, and the application must, of course, be made by the surgeon himself, with the aid of the laryngeal mirror (Form. 65). It is worse than useless to allow such a measure to be attempted by any lay friends or relations of the patient.

Von Ziemssen advises the use of the solid nitrate of silver, and of solutions of that salt to the strength of 240 grains to the ounce of water. In no case of congestion is even a mild solution of the silver salt superior to one of zinc, aluminium, or iron (Form. 65, 56, and 59; and the spasm which is so frequent a result of lunar caustic applications is highly detrimental in a disease where rest to the organ is an all-important factor in treatment. Beyond this objection, I have long believed that applications of nitrate of silver to inflamed surfaces have the effect of inducing hyperplasia; so much so that whenever I have found, in removing a tonsil, the tissue to be unusually dense and gristly, I have suspected a long course of such treatment, and on inquiry my suspicions have generally been confirmed. My colleague, Dr. Orwin, reports to me a case strongly supporting this view, in regard to the influence of silver nitrate on the larynx, which he saw in Buda-Pesth, under the care of Dr. Irsai:—

CASE LXXIV.—It was that of a male patient, æt. 40, who had long suffered from chronic laryngitis, which, during the last three years, had been treated by means of spray applications to the larynx of a 10 per cent. solution of nitrate of silver, with the result that not only had his whole body, especially his face and hands, undergone characteristic discoloration, but thickening of the entire larynx had taken place to such an extent as to

cause dangerous stenosis. For this condition Dr. Irsai had been compelled to perform tracheotomy, and had subsequently widened the glottic opening by means of Schroetter's dilators.

Application by the brush is preferred by me in chronic cases to the use of insufflations or of sprays, though all three methods are employed according to circumstances. The brush is indicated when the portion attacked is limited, the spray when the physical changes uniformly involve the laryngeal area. Mineral astringents are greatly to be preferred to the weaker vegetable solutions of the same character. As the congestion subsides, *faradisation* is sometimes of benefit in restoring tone and co-ordinative power.

Externally the application of wet compresses (Form. 81), and the nightly painting with tincture of iodine over the thyroid cartilage, will be found of value.

Hygienic and Dietetic.—Of primary importance is a careful avoidance of all preventible causes of the affection. First and foremost may be mentioned rest to the voice, not only from professional exertion, but in ordinary conversation. In the home circle the patient should be directed to speak always below his breath, even in a whisper; to avoid irregular vocal efforts, as laughing; and, especially, never to speak in noisy streets or vehicles.

Lessons in elocution with reference to breath-taking are also all-important. The patient when recovered should be directed to take a full inspiration, to commence to ex-spire only with a spoken word, and to utter at first only one word with each expiratory effort. Gradually he may be allowed to say two or three words with each breath, and so to lengthen his sentences to the ordinary extent. In these lessons nothing is better than the Prayer-Book version of the Psalms, pointed as each verse is into four sentences for chanting. These sentences can easily be subdivided and lengthened for the necessary lessons.

All noxious habits of smoking and drinking, exposure to varying temperatures, and the continuance of hurtful occupations, are to be interdicted. For those whose occupations compel them to be more or less exposed to cold or damp atmospheres, the use of the respirator, or one of its efficient substitutes, will be necessary, and will often be found a great help to treatment.

Cold affusions and general tonic measures are useful to many, while in others climatic change to warmer countries will be imperative.

The Turkish bath, from its action on the skin as well as for

the local benefit of the inspired hot, dry air, is often of the greatest value in chronic laryngeal inflammation.

The diet must be simple, nutritious, and non-irritant. As a tonic, a fairly generous Burgundy will be found to be more easily digested and more nourishing than the port of the preceding generation or the claret of the present day.

Laryngitis Sicca.—In advanced cases of atrophic rhinitis and pharyngitis sicca, and very rarely without such an association, catarrh of the larynx results in an exhaustion of the fluid elements of the mucous secretion. The consequence is, that the scales and strings of dry, discoloured mucus are seen to cling to the membrane, itself generally dry and highly inflamed. Efforts to dislodge the adherent mucus are often attended by slight hæmorrhages, and with temporary improvement to the voice, which is otherwise almost or entirely lost.

I have seen this disorder in coal-heavers, sweeps, etc., and have often observed solid particles from the impure atmosphere attendant on their calling in the larynx. It is probable that in atrophic rhinitis, the enlarged nasal space, occasioned by this disease, favours inspiration of unfiltered and unmoistened air, and thus directly leads to inspissation of the laryngeal secretion.

TREATMENT consists in the use of liquefying, emollient, or detergent sprays (Form. 40, 42, and 47) and moderately stimulating inhalations (Form. 29, 30, and 37), to which in cases with scanty secretion the addition of aldehyde is especially serviceable (Form. 31). Concurrent treatment of the nasal and pharyngeal condition is also of importance; while inunction of the nostril by catching, as it were, noxious particles from the atmosphere, and preventing them from entering the larynx, is of distinct value (Form. 82 and 84).

4. SUB-GLOTTIC CHRONIC LARYNGITIS (Fig. 100, PLATE X.).

This represents a peculiar form of chronic laryngeal catarrh, to which attention was drawn by such early observers as Czermak and Türck, and of which cases have also been reported by Burow, and, amongst others, Gehrardt. The last-named author has given it the name of *Chorditis inferior hypertrophica*, because in the course of the disease local hypertrophies in large groups occur in the inferior cavum of the larynx, resulting in a serious degree of stenosis.

The *Chronic blennorrhœa* of Stöerk, to which allusion has been made in relation to its pharyngeal manifestation (page 132),

gives rise to a similar appearance when it extends to the larynx, but is never manifested in this region as a primary disease. According to Klebs the cicatricial formations upon the cords in blennorrhœa are, in their histological elements, very like those of rhinoscleroma. I have seen but one case of laryngeal rhinoscleroma, and in this, the clinical signs and the laryngoscopic appearance were so like those of chorditis inferior hypertrophica, that I believe the diagnosis would have been impossible but for the simultaneous existence of the growth in the anterior nares. It is a question whether, in the absence of any specific bacterial evidence, all these conditions might not be appropriately included as forms of **pachydermia**.

The FUNCTIONAL SYMPTOMS of all sub-glottic forms of laryngitis are in the main **vocal** and **respiratory**, and may extend in the one case to aphonia, in the other to suffocative attacks of dyspnœa.

The PHYSICAL SIGNS are, as already hinted, difficult of exact diagnosis, mainly because it is not always easy to ascertain the exact nature of the thickening.

TREATMENT consists in dilatation, either prior or subsequent to the performance of tracheotomy. The best modes of dilating will be more fully described in the chapter on 'Syphilitic Laryngitis,' in which stenosis, calling for surgical interference, is so frequently a complication.

CHAPTER XIX

OEDEMATOUS LARYNGITIS

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SYNONYMS—Phlegmonous laryngitis; acute oedema of the larynx; oedema of the glottis; laryngeal phlebitis.

The acute effusion of inflammatory exudation into the submucous tissue of the larynx is one of the gravest manifestations of acute catarrhal and specific inflammations and will immediately receive consideration.

Serous infiltration of the submucous tissue may however arise as a *simple edema*, quite independently of any inflammatory process and especially as a manifestation of general dropsy caused by disease of the kidneys, heart or lungs; or according to von Ziemssen, as a result of circumscribed obstruction in the larger veins through compression of the superior and inferior cervical veins or further of the jugular vein, or even of the innominate and the innominate veins. The oedema will be unilateral or bilateral, according to the site and extent of the obstruction to the circulation. Such obstruction may be produced by enlargement of the thyroid gland, swelling of the tuberculous and salivary glands and new formations about the neck, aneurysms of the arteries. It is unnecessary to further allude to these causes except to say that relief of the local condition is only a temporary benefit, since attention must be given to the removal or relief of the cause of the primary lesion.

Acute Edema of the Larynx is a complication of those of erysipelas [illegible] a primary rare affection. [illegible] accurately diagnosticate a case [illegible] on account of the extremely important influence that even a slight effusion may exercise in [illegible] the [illegible] of respiration. It is probable [illegible] already [illegible] that [illegible] it would [illegible] be analogous [illegible]

children, in the form of a membranous laryngitis. An explanation for the preference for a submucous serous infiltration in the one, and for membranous exudation in the other, may possibly be found in anatomical differences. The clinical fact remains, that an acute œdema of the larynx is seldom witnessed prior to the age of adolescence.

Gottstein considers *acute submucous laryngitis* and *acute serous infiltration of the submucous tissue of the larynx*—to which last only he gives the name of *acute œdema*—as two separate diseases.

ETIOLOGY.—Excluding cases resulting from traumatic causes, œdema is much oftener a secondary than a primary affection. Among 6062 post-mortem examinations made at the Berlin Charité, between the years 1869–71, Hoffmann found 33 cases of *œdema glottidis*, 10 of which were of primary and 23 of secondary origin. Sestier found in 190 cases, 36 primary and 122 secondary. Among the general diseases which may give rise to *œdema glottidis*, various forms of cardiac disease, nephritis, and phthisis are the most frequent causes. Gottstein expresses a doubt as to whether serous infiltration of the larynx ever occurs as a primary affection, considering that 'in the great bulk of cases it is a sequel of local diseases.' That acute laryngeal œdema is often preceded by pharyngitis is true, but not more so of it than of a simple catarrhal laryngitis. It is equally a fact that it is exhibited as a direct complication of specific forms of inflammation of the larynx, as of syphilis and tuberculosis, of perichondritis, and of retro-pharyngeal abscess. It is, moreover, frequently associated with acute infectious diseases, and especially with erysipelas and pyæmia. I have experience of one case in which it occurred as a sequel to uræmic poisoning, the indirect result of an enlarged prostate. But this only goes to prove that any condition likely to poison the blood-supply may promote the occurrence of serous exudation, and there are ample anatomical reasons for the selection of the larynx as a favourite site for this condition.

It cannot be denied, however, that acute œdematous laryngitis frequently occurs as an apparently primary affection. Of *predisposing* causes a previously low state of the general health or great bodily fatigue is almost invariably to be observed; for there is almost always a history of long hours of toil, exposure, or travelling. The *exciting* cause may arise from many sources. The patient sits in a draught of cold air, or drives or rides exposed to the bitter keenness of a north-east wind. The probability of the existence of some atmospheric factor in the production of a catarrhal or an œdematous laryngitis has been already alluded to,

and the following case is illustrative of this suggestion. It has many other points of extreme interest which will receive attention in other places more appropriate to their consideration (see page 480):—

Case LXXV.—F. B., æt. 12, was brought to me from Arundel by Mr. Evershed of that town. The history was that having become very hot through labour in the hayfield he lay down to sleep in the open air, exposed to a hot sun simultaneously with an east wind. On awaking he felt pain and stiffness in the neck, afterwards followed by acute inflammation of the right side of the neck and larynx. Acute œdema with great stridor followed, and when I saw him at the end of three months the larynx was found still to be generally inflamed, with considerable infiltration both supra- and infra-glottic. The right vocal cord was also at that time immobile. The diagnosis was acute perichondritis, with simultaneous laryngitis.

In some cases there is no premonition whatever of inflammation, and distress due to exudation is the first symptom manifested. Cases have even been reported in which death occurred without any suspicion of the condition which, on autopsy, was proved to be the cause of death. Probably in such circumstances an unrecognised organic disorder of the circulation has also existed.

Of others less rapidly fatal, but almost equally sudden in appearance, the following are examples:—

1. A man, after a day's work in a blast-furnace, walks in the snow, and sits for hours in his damp clothes smoking and drinking in a badly-ventilated, low-roofed taproom, which he leaves at a late hour, is again exposed to the open air, passes the night in a small room in a close quarter of the town.

2. A cabman takes frequent nips of raw spirit in a hot bar, to 'keep out the cold' to which he is exposed for the rest of the night on his box.

3. Lastly, a young man, tired with office work during the day, spends his evening practising glees at a smoking concert; he takes, on leaving, nothing more than a little cold whisky-and-water, but goes home thoroughly tired to bed.

In each of these instances—all taken from actual experience—the result is the same; the patient awakes from sleep, a few hours after retiring to bed, with a feeling of great discomfort in respiration, which speedily increases to a sense of intense suffocation. And, not to anticipate, all the symptoms of œdema, to be presently detailed, are developed with alarming rapidity, and with but little preliminary warning.

Lastly, traumatic causes may produce acute œdema; such as swallowing hot water—Cohen mentions also extremely cold water—irritant poisons, caustic applications, or inhaling scorching hot air; and, occasionally, injury produced by the introduction of intra-laryngeal instruments for operative purposes, is responsible. In these last cases the effusion is often purely hæmorrhagic; in others it is sero-sanguineous in character.

Œdema of the larynx, especially when of traumatic origin, may develop very rapidly. I remember one case in which the left arytenoid had been wounded by a small fish-bone, and in which laryngotomy had to be performed three hours after the accident. On another occasion, in which the œdema was the result of an intra-laryngeal operation, I had to operate within an hour of its origin.

PATHOLOGY.—Œdema of the larynx consists essentially of transudation of serous, or plastic fluid, into the submucosa. It has been noticed in Chapter X., that such infiltration and its resultant signs are modified by anatomical differences in the thickness and tension of the mucous membrane and submucosa, according to the particular districts of the larynx affected; it has also been pointed out that the ary-epiglottic folds, the ventricular bands, and the tissues in the neighbourhood of the ventricles are the areas which offer least resistance to infiltration.

The commencement of the process is marked by a slight reddening of the mucous membrane, with increased secretion, especially in the neighbourhood of the ventricles, where lymphoid tissue abounds. The parts affected soon become swollen and œdematous, and the membrane being pale and tense. When the ary-epiglottic folds become infiltrated they appear as large yellowish-red tumours, which completely cover the cords, and often produce stenosis in an extreme degree. Usually, the tissue covering only one of the arytenoids takes part in the inflammation and infiltration; this may swell to twice or even three times the normal dimensions, and it is in such cases that rapidly rising dyspnœa develops. In occasional cases both peri-arytenoids are affected. When the epiglottis becomes œdematous it appears as a large round translucent tumour, which may attain such dimensions as to so completely block the laryngeal vestibule that the glottis is concealed from view.

The epiglottis is especially attacked in those cases in which the laryngeal inflammation follows on a pharyngitis. In œdema, associated with the specific poisons of *scarlet fever*, *erysipelas*, *typhus*, *small-pox*, and the like, the infiltration may extend to the muscles and other tissues of the neck. In such cases both the primary and secondary affections are of the most virulent form. Plasma is exuded, and subsequent changes partake of the nature of phlegmonous inflammations. In these circumstances false membrane is formed, and the disease then assumes a pseudo-diphtherial character. The inflammation may be followed by ulceration, which, extending to the perichondrium, may, in rare

cases, terminate in caries or in gangrene. The appearances of an œdema of the larynx in life, and after death, are altogether different, but each is characteristic; the shrunken, wrinkled membrane, resembling the hand of a laundry-woman after long soaking in the wash-tub, which is seen on autopsy, will clearly indicate the prior existence of swelling due to effusion, even where no laryngoscopic examination was made during life.

The **microscopical** characters are such as would be naturally expected from a knowledge of the morbid process. There is an effusion of serum, with, in most cases, an excess of leucocytes in the meshes of the connective-tissue of the submucosa. In the more severe grade the exuded plasma will present the usual characters of coagulated fibrine entangling leucocytes, which may be either reabsorbed or be transformed into pus, and present a typical phlegmon. Examined **bacteriologically** a streptococcus of varying type of virulence will be demonstrated.

Œdema is not always limited to the supra-glottic region, but may also extend to infiltration of the submucosa beneath the vocal cords (Fig. 68, PLATE VIII.). Infra-glottic œdema, as it is then called, is almost invariably secondary, and it is always serous; the effusion is slow in subsiding, and has a strong tendency to pass into the subacute or chronic stage. The diagnosis of the exact character of sub-glottic infiltrations is really very difficult, and practically of not much influence on the prognosis. In some instances the effusion is circumscribed, and this condition indicates the probable formation of an abscess.

SYMPTOMS: A. **Functional.** — There is no occasion to discuss in detail all the various changes in the performance of normal acts which occur in œdematous laryngitis, many of them being similar to those observed in the simple form of inflammation. It is to be remembered also that many cases occur of typical laryngeal œdema, in which there are no symptoms whatever prior to those of a fatal suffocation or syncope.

The **voice** is naturally affected, and is usually rough and deep in tone, or is altogether lost, the alteration being due to thickening and weighting of the cords, and to mechanical impairment of normal muscular contraction.

The **respiration,** as it is the most important function that is affected by œdema, is also that which, as a rule, most prominently attracts attention, and calls urgently for relief, though cases occasionally occur, especially in the course of chronic diseases of the kidneys and other distant organs, in which considerable œdema exists, without respiratory disturbance. A slight exciting cause

will, in such circumstances, produce a fatal suffocation; as, for instance, in the patient reported by Ziemssen, and quoted by Cohen:—

> The man died within a few minutes of entering the Clinic at Greifswalde, from penetration of the wall of the right ventricle of Morgagni by a sharp piece of the rib of a tobacco-leaf. The patient, who had come there on account of Bright's disease, was sitting in a waggon smoking when he arrived.

The chief difficulty in breathing in the early stages is in the act of inspiration, which is quickly observed to be stridulous, whilst in many cases expiration is at first unaltered. The dyspnœa is due to stenosis, caused by œdema of the ventricular bands, of the ary-epiglottic folds, or of the submucous covering of the arytenoid cartilages. In rare cases the symptoms may depend on a similar condition of the infra-glottic mucous membrane. When œdema is considerable, the sense of suffocation is most oppressive. As the disease advances, expiratory distress is added to the inspiratory difficulty, and death by asphyxia may in this way be threatened.

Cough is observed in the acute inflammatory form, and is short, incomplete, and unproductive. It is due to an endeavour to remove the mechanical impediment to respiration rather than to a desire to dislodge secretion. Occasionally the cough is spasmodic, resembling in the adult what is observed in the child during an attack of croup. The act of coughing is frequently very painful.

Deglutition is both difficult and distressful, not only when the epiglottis is involved, but also when the coverings of the arytenoid cartilages are infiltrated, the swelling then implicating the anterior wall of the pharynx at its entrance to the œsophagus.

Pain is a frequent but by no means constant symptom. When the infiltration extends to the adjacent tissues of the neck, distress on movement is naturally increased. Pain on palpation depends somewhat on the mechanical rigidity and tension of the tissues involved.

B. **Physical.**—With the laryngeal mirror œdema is quickly recognised. When associated with acute inflammation, the **colour** is very characteristic, the infiltrated portion presenting the appearance of a globular semi-transparent body of a very bright red tint at the circumference. At other parts numerous highly-injected capillary vessels will be observed, especially on the epiglottis. In the œdema associated with disease of the lungs, kidneys, or heart, the coloration is less intense; whilst it is a conspicuous feature in inflammations secondary to acute infectious

disorders. The vocal cords are invariably of a deep red hue in inflammatory œdema, and when the effusion is sub-glottic the mucous membrane in that situation will almost always be seen to be of a more intense red than the cords themselves. Acute œdema of the vocal cords is an extremely rare occurrence. In cases of hæmorrhagic effusion, the swelling is localised and is of a deep red, the rest of the larynx being entirely or comparatively normal in form and hue. The existence of an abscess may be suspected when a circumscribed, soft, red swelling, less translucent than when the effusion is serous, is observed. I have never seen in the larynx the yellow coloration, insisted on by some authors as characteristic of the presence of pus.

Form and texture may be greatly altered by œdema, and the alteration, as before stated, may be general or partial. Reference to Figs. 65 and 66, PLATE VIII., will indicate the great changes which may occur in configuration.

The special changes characteristic of laryngitis, associated with the exanthemata, have already been detailed at page 442 *et seq.*, but a few words may here be added.

In *scarlet fever* the colour will be modified in patches of varying intensity; in *erysipelas* there will be the peculiar brawny character; in typhus the mucous membrane will be *dusky*; in *small-pox*, pustules will be visible: all these distinctive changes are for the most part to be seen on the epiglottis. When the inflammation is due to the swallowing of boiling water, the epiglottis is usually œdematous, and (especially in young children) the whole surface may be covered by a false membrane, which differs from that of croup or diphtheria in its greater transparency and diminished tenacity. Irritant poisons often produce excoriations and ulcerations, the gravity and extent of which, as also the œdema, depending on the virulence and extent of the noxious influence. When there is injury from a foreign body (Fig. 75, PLATE VIII.), a portion of the mucous membrane may be seen to have been denuded of epithelium, and inflammation will have commenced at the seat of injury.

Alteration of **secretion** is manifested in the form of serous effusion into the submucous tissue, which may become sero-purulent or purulent: this, as recovery takes place, is expelled as a copious mucous or muco-purulent discharge, with, possibly, sanguineous staining.

C. **Miscellaneous.** — These vary greatly according to the primary cause of the œdema, and have been already to a considerable degree indicated. There may be fever, with its accom-

panying changes of pulse and temperature; or, as in sudden œdema in connection with chronic diseases, there may be no special symptoms calling for attention. When once the œdema is manifested, the general effect on the health is one of extreme depression of the system. In all cases there are more or less prolonged periods of repose, and almost always there is an exacerbation of every symptom, subjective and objective, in the night hours.

DIAGNOSIS.—There is no probability of the laryngoscopist mistaking œdema for any other laryngeal condition. The only caution to be observed is not to neglect to seek for the primary cause, which may, as already stated, be found in connection with the heart or kidneys, or may, when local in origin, be masked by the infiltration and accompanying changes.

PROGNOSIS, COURSE, AND TERMINATION.—Recovery from acute œdema of the larynx of primary origin is always doubtful. The issue will be influenced largely by the stage at which the condition comes under treatment, and by the amount of success attending local remedial measures correctly and vigorously adopted —that is to say, by the promptitude with which relief is afforded to the mechanical obstruction to healthy respiration. The duration of an attack—*i.e.* the anxious period—may not last above three or four days; but the patient can hardly be said to be out of danger under two or three weeks, and may even then be the subject of chronic infiltration. Complications may arise, as has been suggested, in the lungs, or by the supervention of a diphtherial or pseudo-diphtherial croup on a simple inflammation, with the possible further result of ulceration or gangrene. When death occurs, it is most frequently due to asphyxia, the direct result of stenosis or spasm of the glottis. Both the symptoms and the prognosis are much more serious when the inflammatory process and infiltration have extended to the tissues beneath the glottis. Another source of danger is the possible advent of suppuration—abscess of the larynx—to which allusion has already been made.

The forecast of a secondary œdema must be regulated by an appreciation of the primary cause of the disease.

TREATMENT: **General.**—In mild cases treatment should be commenced on the lines indicated for catarrhal laryngitis, the remedies being modified in the secondary forms in accordance with the primary cause.

Beyond the promotion of diaphoresis and diuresis by mild salines, I do not prescribe general drug treatment; since the introduction of pilocarpine, I have found benefit follow its hypo-

dermic administration in doses of from $\frac{1}{12}$ to $\frac{1}{4}$ of a grain. The remedy is to be employed with caution, in view of possible renal and cardiac complications. The cough often demands relief by sedatives. Iron is indicated as a tonic of specific value in many of the secondary forms.

Regulation of the temperature of the room, and the use of inhalations, will be of service, while the effect of applications of continuous cold by the Leiter coil is even more markedly beneficial than it is in the catarrhal form of inflammation.

So soon as, and wherever œdema is discovered, local scarification with the laryngeal lancet should be employed. There is probably no other severe throat disease that can be so quickly relieved by a simple local measure as can œdema of the larynx, and the operation is one of really easy performance even to a practitioner having but moderate skill in the use of the laryngoscope. The relief to the local distress and the consequent improvement in the general comfort of the patient are sometimes little less than magical.

There may be recurrence of the œdema after scarification, but the tendency thereto is diminished by employment of pilocarpine, and perseverance in the use of the cold coil. If, in spite of scarification and the other means recommended, œdema continues, with consequent increase of respiratory distress, general enfeeblement, and symptoms of blood-poisoning, tracheotomy must be performed. When the disease is due to traumatic causes, this procedure may be necessary at a quite early period, but in uncomplicated cases it is always better to give less heroic remedies a chance. Even when death has apparently taken place, as it may do most suddenly, the windpipe should be opened, and artificial respiration tried.

Bearing in mind the possibility of infra-glottic œdema, we should open the trachea as low down as possible. There is the risk, in this condition of the loose packing the swollen mucous membrane before it, instead of directly in front, that the tracheotomy tube passes between the mucous membrane and submucous layer. This is a serious accident which has happened to good surgeons; it will be most generally avoided by opening into the trachea with a free incision, so that [illegible]. Even after the [illegible] has been reduced [illegible] of paralysis of the [illegible] infiltration.

In the case of [illegible] by means of a

guarded laryngeal knife. The head of the patient should after the incision be quickly lowered and bent forward to prevent, as far as possible, the passage into the trachea of the escaping fluid. When pus is liberated, it is quite possible that there will be a temporary exacerbation of the dyspnœa and cough, to be followed in a few moments by great relief.

2. Chronic Œdema of the Larynx.

Synonym.—Chronic laryngeal cellulitis; passive œdema of the larynx.

Chronic serous infiltration of the laryngeal submucosa may remain after subsidence of an acute attack, or it may complicate some of the subacute specific diseases of the larynx, the result of perichondritis, however caused, and of syphilis and cancer; but in my experience simple or passive œdema is seldom witnessed in connection with tuberculosis. In its chronic form œdema is more frequently unilateral than in the acute, while infra-glottic œdema is almost always subacute in intensity, and is very slow to subside. Chronic serous infiltration of the larynx often exists as such from the first when occurring in connection with the diseases of circulation and excretion already mentioned in our description of the acute form; and an accidental cold or other circumstance may develop symptoms alarming both in the intensity of their degree and the rapidity of their manifestation.

Pathology.—We have seen that in the acute form there is a transudation of serum into the meshes of the submucosa, and a more or less extensive diapedesis of leucocytes, which, rarely proceeding to suppuration, become organised into connective-tissue. These changes are for the most part identical, whether the infiltration be of the submucosa of the epiglottis, of the inter-arytenoid or ary-epiglottic fold, or of the tissues beneath the vocal cords.

Independently of chronic serous effusion some thickening of the mucosa and submucosa often remains after acute inflammations of the larynx and also attends many of the chronic forms of laryngeal catarrh. This is especially true of the laryngitis of alcoholism, of syphilis, and of the sub-glottic hypertrophic inflammations. Submucous thickening, when occurring in the course of a chronic catarrhal laryngitis, especially if also accompanied by local anæmia, is often premonitory of tuberculous deposit.

The symptoms of a chronic œdema or submucous inflammation are those generally of the acute form, with less severe respiratory distress, and of modified intensity generally.

The laryngoscope reveals the PHYSICAL signs of enlargement of the portion involved, the swelling being of a more solid and less translucent character than in the acute form. The appearance of the sub-cordal swelling is represented in Fig. 100, PLATE X.

PROGNOSIS is grave, but the disease, though rarely subsiding entirely, may be very slow in its progress. Treatment is only of avail in so far as there may be a constitutional cause amenable to constitutional medication. But when chronic œdema is associated with perichondritis but little is to be done. Exceptions exist in the case of general or limited laryngeal œdema connected with syphilis, and in infra-glottic œdema when it occurs as a sequel of an acute infectious disease, and is unaccompanied by caries. Scarification is less likely to give relief in the chronic than in the acute form, because the effusion is of a less fluid character. This is particularly true of sub-glottic infiltration. In this variety there is a hope of saving life by early tracheotomy—the windpipe being opened as low as possible. The tube will very probably be required to be permanently retained. Chronic œdema in connection with syphilis will sometimes be relieved by large doses of potassium or sodium iodide. It is also particularly amenable to mercury, whether applied locally over the region of the larynx (Form. 82) or by general inunction.

Stenosis due to sub-glottic infiltration is rarely improved by dilatation, because the narrowing of the breathway is by thickening of the walls laterally rather than in the whole circumference.

CHAPTER XX

LARYNGEAL PERICHONDRITIS AND ITS ASSOCIATIONS

(*Open out* PLATE X. *at end of the Book, during perusal of this Chapter*)

ETIOLOGY AND PATHOLOGY.—In both syphilitic and tuberculous inflammation of the larynx, and also in carcinoma, resulting ulceration may extend to the perichondrium, and may lead to death and in some cases also to dislodgment of a portion or even the whole of one of the cartilages.

Morbid changes in the cartilages of the larynx may, however, undergo degeneration quite independently of any of the dyscrasiæ just mentioned; and these changes may be brought about in three ways: (1) by simple ossification; (2) by ossification due to chronic disease and often associated with fibroid degeneration; and (3) by acute diseases commencing in the perichondrium. The first affection is obviously one of old age, and may or may not be accompanied by arthritic deposits; as a rule, the second also occurs at an advanced period of life, though I have seen one case, to be again mentioned presently, of this disease in quite a young girl, due to repeated inflammatory attacks; the third is due to traumatic causes, or is the result of the phlegmonous inflammation complicating typhus, erysipelas, etc. Ziemssen, Stöerk, and Gerhardt have reported cases of perichondritis due to *decubitus*—that is, to pressure of the plate of the cricoid against the vertebræ in the case of aged persons confined to bed, and obliged to lie constantly on the back, or, as the result of a very long-continued illness, entailing the same position. Similarly, liability of this cartilage to perichondrial changes has been attributed to repeated irritation from the swallowing of imperfectly masticated food.

Most authors appear to consider that caries is a *necessary* sequence of perichondrial inflammation, but this is certainly incorrect, for in not a few cases the inflammation terminates in resolution with more or less thickening and functional impair-

ment, but without caries or separation of any portion of the cartilages.

Of the exciting causes to the first variety of perichondrial inflammation must be named, as almost invariably present, the diarthous influence, locally manifested; although primary perichondritis of the larynx is not an infrequent attendant of senile decay independent of diathesis. The following is an instance:—

CASE LXXVI.—Mr. G. B., æt. 53, residing at Newcastle, consulted me in September 1878, on the advice of Dr. Macaulay, of that city. He stated that he had suffered for five years from hoarseness, the cause of which he could not assign. This symptom had been unaccompanied by pain. In July 1878 he had taken a severe cold in the head, which appeared to travel down to the throat; the voice became much worse; and a day or two later, on walking to his office, half a mile from his home, he noticed that his breathing was short. Though for some weeks he had experienced slight catching in his breath before sleep, it was only ten days prior to his visit to me that he had had his first serious attack of dyspnœa, and this awoke him from sleep at night.

The attack was repeated with, on each occasion, stridulous breathing, and his respiration during sleep was generally very noisy.

The patient had enjoyed fairly good health, and as a superintendent of railway traffic, had travelled a good deal. During his journeys he had been accustomed to converse on business, and had often felt his voice tired. He had never had syphilis, and was an abstainer both from alcohol and tobacco.

His family history was bad: his father, who had been asthmatic for many years, had died at 65; his mother, of phthisis, at 59, and two brothers and a sister of the same disease. One married sister, æt. 50, was living, and in good health.

FIG. CCXVII. — PRIMARY PERICHONDRITIS OF LARYNX.

Examining the patient I found his *voice* almost suppressed, but occasionally giving a high-pitched hoarse note. *Respiration* was continuously embarrased and stridulous, with aggravation on the least exertion; and was always worse at night. *Cough*, irritable, dry, and unproductive. *Expectoration*, scanty and glairy. *Pain* only for the last two days, and radiating from the larynx to the ear. Slight tenderness on pressure over the right side of the larynx, at the situation of the thyroid cartilage, and especially over the cricoid The soft tissues of this region were thickened.

Examining the larynx the left vocal cord was obscured except at its posterior extremity by inflammatory swelling of the corresponding ventricular band. The right vocal cord was somewhat congested at the posterior part, and the mucous membrane beneath it greatly infiltrated as with œdema, the swollen tissue being pink and translucent. The left vocal cord was quite fixed, and there was but little movement of the right. On examination of the lungs a very good percussion-note was obtained generally, though but little air was entering. There was no evidence of aneurysm, of enlarged bronchial glands, or other disease, and the diagnosis was *laryngeal perichondritis, probably involving all the cartilages, and especially the cricoid.*

After consultation with Mr. Nunn, tracheotomy was performed with considerable relief to the breathing; but the patient's health was never regained, and Dr. Macaulay informed me of his death, at home eighteen months later, of gradual decline. His lungs remained healthy, nor was there any actual evidence of abscess in the region of the larynx; but the pain and swelling continued, and even increased.

Fibroid degeneration, which is rare, is probably due to strumous causes.

CASE LXXVII., to which I have alluded on page 478, occurred to me in July 1875, and came under my notice in consultation with Dr. Gilbart Smith. The patient, who was a slight, delicate girl, æt. 15, complained of severe difficulty of breathing, which had existed for three months, with loud stridor, both inspiratory and expiratory.

Tracheotomy was advised, but death took place suddenly and quietly on the day appointed for its performance. The autopsy showed œdema of the larynx with ulceration of the right cord, involving also both the right arytenoid and the cricoid cartilages, which as well as the thyroid were unusually soft on section. The right bronchus, the right pneumogastric and recurrent nerves were embedded in a mass of hypertrophied gland tissue. The lungs and heart were healthy, and the case was considered by us as one of scrofulous perichondritis of the larynx. The Morbid Growths Committee of the Pathological Society confirmed our opinion, and reported that there was no evidence of either tubercle or syphilis.

I have never seen primary perichondritis of the epiglottis, though such a disease has been described; it must in any case be rare. Spicer has mentioned such a case as occurring in a boy, æt. 10. In Fig. 99, PLATE X., is delineated what was believed to be a gouty deposit in, or calcareous degeneration of, a portion of the epiglottis, and there were symptoms of gouty perichondritis around the right crico-arytenoid articulation. The patient was, however, only seen twice, and the after-history could not be ascertained.

Acute perichondritis of the larynx is rarely primary, and usually occurs in persons of advanced life. The following is, however, an instance of this disease in a child, and on account of its interest is narrated at length.—

The case is that of F. B., æt. 12, to which brief allusion was made (CASE LXXVIII.) at page 469, when considering acute œdema of the larynx. The boy had gone to sleep in a hayfield one day early in July after having become hot and tired with labour. On awaking he felt pain and stiffness in the neck. The next morning his mother roused him from sleep in the early morning because of the 'noise he was making in his breathing.' He felt intense earache first in the left ear for three weeks, and then it went to the right ear, lasting on that side fourteen days. On the first morning he could not speak when awaked, but the next day could do so hoarsely. After that his voice became gradually reduced to a whisper. It had been quite lost for six weeks. The history given by Mr. Evershed, of Arundel, who brought him to me on September 15th, 1886, evidently pointed to acute inflammation of the whole tissues of the larynx and of the neck. He was immediately taken into the Central Throat and Ear Hospital. His condition was as follows:—*Voice*, quite extinct. *Cough*, none. *Respiration*, embarrassed on exertion, noisy in sleep. *Deglutition*, painful. *Temperature* and *pulse*, normal. *Lungs* resonant in front, rather dull at upper posterior part; breath-sounds faint, harsh, and dry; expiration prolonged. *Appetite*, good. *Weight*, 5 st. 8 lb. The neck was no longer swollen, but there was distinct tenderness on even gentle manipulation of the larynx externally, and the *pomum* was somewhat thickened. With the laryngoscope there was seen to be considerable œdema of both ary-epiglottic folds, and a thickened and somewhat granular condition of the anterior two-thirds of the vocal cords, so that there was no space to be observed between them even on full inspiration. The cords

generally were inflamed, and the right cord, or rather its corresponding arytenoid cartilage (Fig. CCXVIII.), was immobile.

The diagnosis was that acute œdema and perichondritis had occurred simultaneously, and that both had now passed into the subacute stage.

He was ordered a milk diet, a Leiter cold coil to be worn constantly; hypodermic injections of $\frac{1}{12}$ grain of pilocarpine were made on the 16th, 17th, and 18th, and of $\frac{1}{8}$ grain on the 23rd, without much effect on the local condition. He had no other remedies for the first fortnight, then he was ordered iodide of iron with iodide of potassium, and frequent inhalations of the vapour of benzoin (Form. 27). The granular state of the cords decreased; but their median line of demarcation, as well as the difference of level between them and the ventricular bands, gradually became less distinct, and on October 24th these tissues appeared to have become quite united (Fig. CCXIX.): there was a small rounded prominence at the most anterior visible portion of the right vocal cord, which was still impaired in mobility. On this day I first introduced Whistler's cutting dilator, and repeated its use on the 27th, and afterwards twice a week till November 4th, when the glottic space was seen to be much larger; but a well-defined sessile projection was now observed on the right vocal cord in the situation of the before-mentioned slight prominence. The larynx was still further opened with the dilator, and on November 15th the projection on the right cord was seen to be a distinct growth (Fig. CCXX.). A wire loop and Voltolini's sponge were now employed, and after four or five operations, all trace of the growth was gone (Fig. CCXXI.). After that Schroetter's No. 2 size hollow vulcanite dilator was introduced every other day, with occasional use of the cutting dilator. Return of the voice was first observed on December 6th, and from that time improvement was progressive. He left the hospital for a holiday at home on December 22nd with a somewhat hyperæmic but patulous larynx; the cords devoid of new growth and both acting equally. He had a fairly good, though rough voice, and complete ease from all respiratory symptoms. He had gained 12 lb. in weight during his stay of thirteen weeks. On January 17th, 1887, this patient returned with voice much stronger, and the larynx generally less congested. The small portion of the glottis still adherent was divided, and dilatation continued till the opening was normal in area.

FIG. CCXVIII.

FIG. CCXIX.

FIG. CCXX.

FIG. CCXXI.

FIGS. CCXVIII., CCXIX., CCXX., AND CCXXI. — PRIMARY PERICHONDRITIS. VARIOUS VIEWS DURING TREATMENT.

It is probable that in almost all perichondrial inflammations which are not the result of traumatism, the disease commences in

the neighbourhood of the crico-arytenoid joint. In many cases the delicate articulations between the arytenoid and cricoid cartilages become the seat of plastic exudation, and even after the acute stage of an inflammation has passed off, partial or complete immobility of the vocal cords results. Schroetter reports eight cases of stenosis due to anchylosis of the arytenoids from perichondritis following *typhus*. Lunning, of Zurich, and Sestier have found it frequently in *typhoid*. In both these diseases there is, of course, extreme exhaustion, and the patient is lying supine during many weeks. How much, therefore, of the perichondrial changes may be due to a specific poison, and how much to *decubitus*, it is not possible to determine. Another form of this kind of anchylosis occurs in connection with tuberculosis, even before occurrence of ulceration; such a condition being analogous to the scrofulous stiffening of the larger joints.

I have seen two examples, in each of which there was, I believe, anchylosis of the crico-arytenoid articulation due to rheumatism.

The first (CASE LXXIX.) occurred in a young gentleman, aged, when he first came under notice, about 12. He has been under my occasional observation ever since, and is now about 33. His right cord is quite fixed, and his voice has always been hoarse, though it has improved with the lapse of years.

The other (CASE LXXX.) is that of a man 73 years of age, who attended the hospital in 1887, and in whom it was impossible to otherwise account for the fixture of the right vocal cord, and for a persistent hoarseness.

In the first case the arthritic diathesis was strongly manifested in the father. In the second, the patient has several evidences of the same condition in the joints of his hands, and in the cartilages of the ears.

Another chronic form of perichondritis, not leading to caries or abscess, is that associated with syphilis, and is explained by organisation of the inflammatory exudation.

The following two cases are recorded as ordinary examples of secondary perichondritis, the first in connection with syphilis:—

CASE LXXXI.—F. S., æt. 39, a labourer, was admitted into the hospital, November 15th, 1866. He stated that he had suffered from primary syphilis nineteen years previously, and since that time had had occasional sore throats. Two months before application 'he had noticed a lump in the apple of the throat.' It was not painful, nor did it interfere with swallowing. His breath was short and his voice hoarse.

On external examination, a moderately soft, semi-elastic, bilobular swelling, about the size of a hen's egg, was observed in front and rather to the left of the larynx. Situated on a lower level than would have been the case had it been an enlarged bursa over the hyoid bone, and higher than the position of the thyroid gland. It was judged to be a gumma, the diagnosis being confirmed by the presence of a 'punched-out' ulcer, at the upper end of the swelling, about the size of a shilling, and a quarter of an inch in depth; and at the lower and left part a highly inflamed spot of rather smaller area.

On laryngoscopic examination the left arytenoid cartilage and left ary-epiglottic fold were seen to be greatly swollen, and the left vocal cord was immovably fixed (Fig. CCXXII.).

FIG. CCXXII.—SYPHILITIC PERICHONDRITIS.

To complete the history, it may be briefly mentioned that the gumma over the larynx required opening in a few days; that the external ulcer healed under application of black wash, and that the general condition of the larynx improved under a course of twelve mercurial inunctions of the limbs and trunk. A gumma then developed in the posterior middle portion of the right lung, and was accompanied by high fever. This was reduced by local mercurial inunction and salicylates internally. Another gumma then developed in the soft palate above the right tonsil; this suppurated and required to be opened; concurrently he suffered from bilateral tonsillitis. He made in the end a good recovery, but though both the external and internal laryngeal swelling became much reduced, the vocal cord remained fixed. The patient was unable to take iodides in any form.

The next case is one of chondro-sarcoma, which occurred in the clinique of my colleague, Dundas Grant. The disease probably commenced in the region of the crico-arytenoid articulation, but later involved the right side of both the thyroid and cricoid.

CASE LXXXII.—C. W., æt. 43, a tramcar-driver, applied at the hospital on August 10th, 1886, on account of pain in swallowing, which had existed for only a week or two, but had each day become intensified. Neither voice nor respiration was seriously distressed when first seen. On laryngoscopic examination the appearance in the accompanying drawing was presented. The infiltration of the tissues covering the right arytenoid cartilage was very considerable and semi-solid in character, and, as will be observed, the demarcation of the eminences of Wrisberg and Santorini was by no means lost, as is the case in simple serous œdema. The right cord was obscured by the swelling of the ventricular band, and the whole right side of the larynx was fixed.

The diagnosis from syphilitic or other form of perichondritis was clearly established, not only by a marked general malignant cachexia, but also by the almost stony hardness of an external swelling in the right superior cervical region.

The temperature never ranged above 99°, and was frequently below normal. Once or twice it fell to 97.5°. The case progressed very rapidly, and the patient died away from the hospital on December 20th, about four months from the date of his first symptoms. Unfortunately no autopsy was obtained.

FIG. CCXXIII.—LARYNGEAL CHONDRO-SARCOMA AND PERICHONDRITIS.

SYMPTOMS.—It is hardly possible, in the consideration of this disease, to follow the order observed throughout this work, since in its subacute and chronic form perichondritis is so insidious that both functional and physical signs undergo very gradual changes. The first symptom is generally one of localised **pain,**

often ascribed to neuralgia; but careful external examination will frequently detect a slight unevenness at the painful spot, and the part will be distinctly tender to touch; sometimes there is to be felt by the surgeon a crepitation or grating similar to what one discovers on movement of an arthritic knee-joint; concurrently, or soon afterwards, the patient will complain of more or less difficulty in **deglutition,** of a feeling of stiffness in the larynx, and of a 'catch' in the **respiration,** which will also be embarrassed on the least exertion. This question of dyspnœa is one of importance, as it will greatly influence the indications for treatment. It may be due to 'œdema, immobility, and median position of one or both vocal cords, abscess, impaction of the necrosed cartilage in the glottis, collapse of the cartilaginous wall of the larynx, and finally in the healing of the ulceration; this is almost entirely confined to syphilitic cases' (Hall). Concurrently with the difficulty of breathing, the **voice** will be noticed to be hoarse, possibly rather high-pitched, and **cough** will become stridulous, and somewhat paroxysmal. With all this the patient will not perceptibly emaciate, unless the disease be associated with cancer or tubercle; or—to put in another way—loss of flesh will be more gradual than is usual in either of these diseases; he will continue to take exercise, or even to follow his vocation; and the morbid condition may not vary, or the symptoms may only become slightly aggravated, for many months.

On **laryngoscopic examination** at this stage, physical changes will be by no means well marked. In many cases, beyond capillary injection of the mucous membrane, there will be little or no indication to the eye of the serious changes that are taking place in the deeper structures. Macdonald lays stress on what he terms a 'crowding of the laryngeal structures towards the middle line by surrounding perichondrial swelling,' a phenomenon by no means constant, and, according to my experience, most frequently manifested in syphilitic cases. When an abscess forms, it is very difficult to distinguish whether it arises as the result of an inflammation of the submucous tissue or of a perichondritis. When the disease affects the thyroid cartilage there will be more or less external tumefaction (sometimes almost inappreciable in amount), and some hyperæmia of the ventricular band of the affected side. If the arytenoid cartilage or the crico-arytenoid articulation is the part attacked, the vocal cord will be inflamed with possibly sub-glottic swelling, and more or less impairment in the action of the cord of the affected side will be observed (Fig. 98, PLATE X.). The arytenoids may be attacked singly or

together, and by their enlargement may encroach upon the lumen of the glottis. This also will be evident in the mirror. If the cricoid cartilage is diseased, the tumefaction, being situated beneath the vocal cords, may be (Fig. 100, PLATE X.) under certain conditions obscured. This is especially the case if one side of the cartilage is first attacked (a very rare circumstance), instead of, as is usual, one of its plates, or if the disease commences in the perichondrial layer adjoining the œsophageal wall, which is also rare.

The following case, a secondary result of typhoid fever, is believed to be of this variety:—

CASE LXXXIII.—J. H. M'D., æt. 28, an engineer, was admitted into hospital on June 4th, 1885, stating that he had only risen from bed two or three weeks previously after a protracted attack of typhoid fever. For the last fortnight he had experienced a gradually increasing difficulty of breathing, and now had also frequent attacks of choking, with cough and expectoration. He complained of no pain. Laryngoscopy showed a small erosion of the left angle of the epiglottis and general laryngeal œdema, producing considerable stenosis. There was a suspicion of syphilis, though no acknowledged history, for there was an unindurated scar on the dorsum of the penis, and a string of shot-like glands in each groin. His *voice* was high-pitched and polyphonic; his *respiration* noisy and stridulous on inspiration. There was but little air entering his lungs, which were free from any evidence of disease. He suffered from profuse nocturnal sweatings. He was ordered full doses of iodide of potassium; and a meeting was arranged for the purpose of performing tracheotomy, but the patient died thirty hours after admission. On *autopsy*, the *lungs* were collapsed, especially the right, and there was some muco-pus in the larger bronchi. There was neither consolidation nor tubercle. The *heart* was healthy. There were three or four scars of recent ulceration near the *ileo-cæcal valve*. On examining the *larynx*, the mucous membrane was observed to be generally puckered and sodden. Pus was seen to issue from a small fistulous opening behind the junction of the cricoid and thyroid cartilages on the left side, and in front of the œsophagus. On dividing the larynx from behind through the middle line, an irregular cavity, which extended laterally on both sides, was opened; it contained pus, and the left posterior plate of the cricoid cartilage was separated from the perichondrium, and was rough and necrosed.

Under certain conditions the action of the vocal cords may not be greatly impeded, and occurring, as the disease does, in old people, slight muscular palsy may not give rise to any apprehension. Fränkel explains the immobility and median position of one or both cords as a mechanical result of the loss of attachment of the postici to the cricoid cartilage, and not as due to a paralysis. If only a small amount of damage is done to the crico-arytenoid joint, when recovery occurs, the fixed position of the cord may be readily mistaken for the result of paralysis of the crico-arytenoideus posticus.

In the case of any patient coming with symptoms such as have been sketched, the greatest attention must be given to commemorative signs as well as to laryngoscopic appearances, for it very frequently happens that only by careful differentiation

of points in the individual and family history can an exact diagnosis of the nature of the perichondrial disease be ascertained. There is very often a distinct personal experience of gouty attacks in other portions of the body, with evidence of uratic deposit in one or more joints of the extremities.

CASE LXXXIV. was that of a lady, æt. 62, who came under my care in 1878. Slight dysphagia was the prominent symptom, and the opinion had been given that she was the subject of malignant stricture: she had recently had an attack of gouty iritis; she had chalky deposit in the distal phalangeal articulation of each little finger and in the auricular cartilages, and local manifestations in the larynx were gradually giving evidence of undoubted perichondrial change (Fig. 100, PLATE X.). The later history confirmed this diagnosis.

PROGNOSIS, COURSE, AND TERMINATION.—Perichondrial inflammation, and degeneration of a laryngeal cartilage, must always be viewed with real alarm as to the possible result to life. Cases (non-specific) have occurred, however, in which the arytenoid cartilages have been discharged and the patient has recovered; and such a result has even been reported after extrusion of the plate of the cricoid. Chronic syphilitic perichondritis is not always fatal, though but too often an acute relapse occurs which calls for tracheotomy. Even when tracheotomy is not rendered necessary, there is more or less injury to both the vocal and the respiratory mechanism, from anchylosis and more or less general cicatrisation.

The comparatively passive, early stage of all forms of subacute perichondritis passes gradually into one of greater gravity, on the occurrence of caries; the urgency is caused by formation of an encysted abscess around the diseased cartilage, which in its growth greatly aggravates all the symptoms, and may lead to extreme stenosis of either gullet or larynx. This abscess may burst and portions of necrosed cartilage be discharged from it. Such an abscess may open into the œsophagus, or into the larynx, leading—it may be—to a fistulous communication between these two passages; or, if the disease be anterior, there may be an external fistulous passage possibly complicated by subcutaneous emphysema. Death may take place at a comparatively early stage, but is usually due to exhaustion, from the suppurative discharge and consequent irritative fever.

TREATMENT.—Beyond relief of the inflammatory process by the application of continuous cold, sedative inhalations, etc., not much can be effected, because there is probably no measure which can arrest perichondrial caries when once established, and all the surgeon can do is by every care to perfect his diagnosis, and to watch attentively for signs of suppuration. He should then, if possible, open the abscess, having first, unless the pus can

be reached from without, performed tracheotomy. On no account should the idea of laryngotomy or laryngo-tracheotomy, as advised by some authors, be entertained; indeed, it is very doubtful whether this operation should ever be performed for the relief of any laryngeal condition except for quite temporary purposes, as for instance in the case of a foreign body. Whenever a tube has to be worn for any length of time, the further it is from the laryngeal cartilages, the greater the chance of the patient living more than twelve or eighteen months after the operation, which is probably about the average extension of life usually gained by tracheotomy when performed for chronic laryngeal disease.

Where there is stricture of the œsophagus, feeding by the œsophageal tube may be employed; the irritation, however, of such an instrument is but too apt to increase the evil, and this method of providing nourishment should be reserved for those cases in which there is a fistulous communication between the larynx and œsophagus.

There are few cases in which raw-egg feeding cannot be pursued, to which form of dietary may be added one or two daily nutrient enemata.

TRAUMATIC LARYNGITIS; FOREIGN BODIES.

Injuries to the larynx may be **external** or **internal.** In both and especially in the first, the cartilaginous structures are very apt to be involved.

Traumatic perichondritis from wounds is by no means so rare as is generally supposed, and is not a very infrequent result of intra-laryngeal operations for the removal of growths, or of external injury by knife, sword, or gunshot. Von Ziemssen has also alluded to 'the frequent introduction of the œsophageal sound in persons whose cricoid is ossified,' as a by no means rare cause of cricoid perichondritis. Traumatic inflammation is generally confined to this cartilage and to the arytenoids.

The thyroid although equally with the other cartilages liable to degenerative processes, is less frequently the subject of traumatism. The following is an exceptional instance:—

CASE LXXXV.—Mr. J., a gunnery lieutenant in the Royal Navy, applied to me in 1888 on account of loss of voice which had occurred suddenly after a blow of another player in a football scrimmage. The

There was no sign of fracture, and the laryngoscope gave no evidence of displacement.

Beyond the inflammations of the laryngeal mucous membrane, which may be set up by the accidental or intentional swallowing of scalding fluids and chemical caustics and irritants—solid, fluid, and gaseous—to which allusion has already been made, a few words require to be added on the entry of **foreign bodies** into the larynx.

The modes of the introduction are various—in the child, during sleep or play, or from the instinct to make the mouth the receptacle of attractive articles. In the adult from talking or laughing while eating, by dislodgment of artificial teeth as in a fit or during sleep, and in the case of fluids by the entry of the contents of abscesses into the larynx, of blood during operations, or from the regurgitation of fluid in drinking, or of vomited matter. Lastly, foreign bodies may be introduced into the larynx for suicidal purposes.

No object would be served by attempting to enumerate a list of the multiform articles which have thus 'gone the wrong way.' Every surgeon—almost every practitioner—could quote a case of quaint interest. The fullest catalogue with which I am acquainted is to be found in Roe's interesting contribution to Burnett's system.

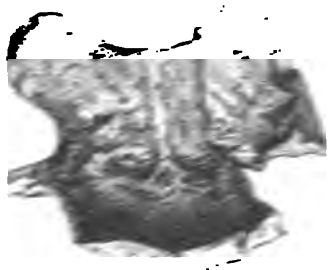
My own experience would include a sting of a wasp, the bones of fish, sheep, and rabbit, coins, pins, fruit stones, a fragment of a wine cork inspired by an eminent tenor who laughed while drinking, portions of toys, and plates of artificial teeth. Of this last nature I had one interesting example:—

CASE LXXXVI.—The plate was an upper one, and was of larger dimension than that of the laryngeal cavity when normally opened to its fullest extent, across which

FIG. CCXXIV.—TOOTH-PLATE IN GLOTTIS.

FIG. CCXXV.—TOOTH-PLATE REMOVED.

it was stretched, leaving a small aperture for breathing both in front and behind (Fig. CCXXIV.). The nature of the trouble was not suspected, the patient being brought to me for an opinion as to whether she was the subject of tuberculosis or carcinoma, so



[illegible]

cords; (5) immediately beneath the vocal cords; and (6) i
trachea or bronchi. About 50 per cent. of foreign bodie
are drawn into the air passages pass into the trachea, a
per cent. are arrested in some portion of the glottis. In
25 per cent. the foreign body passes into the bronchi, the
being most liable to receive it.

DIAGNOSIS in most instances should not be difficul
since the introduction of the X-rays could rarely fail to be
absolute.

TREATMENT.—As regards injuries to the larynx, d
irritant poisons, one would naturally in the first instance t
appropriate antidotes. But the surgeon would rarely arrive
the stage for their employment had passed; and he wo
called upon to treat the resultant œdema. This is a partic
marked symptom and one of the greatest gravity, in the c
the sting of a wasp or bee, and fatal cases are on record fro
a cause. If the œdema is so pronounced as to seriousl
barrass the breathing, immediate tracheotomy may be dem
but as a rule it would be wise to first try the effects of sc
tion, the sucking of rice, and the application of a col
Should these fail, and tracheotomy be performed, the *low*
tion (p. 184) being selected. As to *foreign bodies* of a
consistence, it is needless to say that, where discomfort is
than temporary, the object itself should be removed, but a
subject is fully discussed in all treatises on general surger
almost enough to remark that success in this matter d
largely on the skill and readiness of appliance of the op
into whose hands the case may come. It is a fact of s
interest that the mere operation of *laryngotomy* will ofte
to the prompt expulsion of a foreign body, situated at
either above or considerably below that of the laryng
cision.

For the reason just stated, and on all grounds of
laryngotomy or a *high* tracheotomy should be a prelimi
division of the thyroid cartilage; but thyrotomy itsel
procedure which should be adopted with hesitation, b
from the difficulty in bringing the cut edges of the ca
into complete apposition, there is always a fear of a per
impairment of voice.

CHAPTER XXI

DIPHTHERIA AND CROUP

(*Open out* PLATE VII. *at end of the Book, during perusal of this Chapter*)

SINCE the last edition of this work the subject of diphtheria has been viewed with reawakened interest, in consequence of the announcement in 1894, by Behring of Berlin and Roux of Paris, that the malady could be successfully treated by a serum remedy, based on its specific bacteriological nature.

As a result of my personal study of the question, I published a monograph on *Diphtheria and its Associates* in June 1895, which reached a second edition in the following year.

But the whole subject has now become such a large one that it is impossible to discuss every problem pertaining to the disease in a single chapter of a systematic work, and I am therefore obliged to limit present consideration to statements, with as little argument as possible, of those conclusions which admit of general agreement, referring my readers for further information to my separate monograph, and to the many able contributions which have been issued by others during the last three or four years.

Definition.—Diphtheria is an acute infectious disease, due to the presence of a specific micro-organism—the Klebs-Löffler bacillus.

1. Diphtheria is to be considered as simple or pure when this specific bacillus constitutes the *sole* organism, and it may then be termed simple bacillary diphtheria.

2. Diphtheria is to be considered *complex* or *impure* when the bacillus is *associated* with other micro-organisms, which are chiefly cocci, and the disease may, in these circumstances, be termed complex or cocco-bacillary diphtheria.

3. The term *pseudo* or *false diphtheria* represents an affection of the throat resembling diphtheria, but distinguished from either the simple or the complex variety by the *conspicuous absence* of the *specific bacillus*.

4. The term *pseudo-diphtheria* has also been erroneously applied to an affection of the throat which may even be membranous, and is characterised by the presence of a bacillus *identical* with the Klebs-Löffler in every respect, *save that of virulence.* A preferable term would be '*non-virulent bacillary diphtheria.*'

To avoid confusion, the terms 'diphtheria' and 'diphtherial' are alone employed by me to designate the phenomena caused by the presence of the Klebs-Löffler bacillus, whether present alone or in association with other micro-organisms.

The term 'diphtheritic' should, indeed, have been considered as obsolete since the time that Trousseau, having shown that the inflammatory state is but mildly evidenced, substituted the word *diphtherie* for *diphtherita*; the same objection may be taken to the word 'diphtheroid,' which is now superseded by the terms 'pseudo-diphtherial' and 'coccal.' It must also be remembered that the term 'diphtheria,' as defined by Bretonneau and Trousseau, represents the skin, parchment, or leather-like membrane which is its chief clinical characteristic, and there is no logical reason why this useful clinical definition should not continue.

Thus, having agreed that true diphtheria is due to the Klebs-Löffler bacillus, we must assume that all other forms of membranous sore throat are pseudo-diphtherial, not so much, or even at all, as regards their histo-morphological, but as to their bacteriological features.

Coming to the question of the morbid products of diphtheria, and the distinction between a membranous sore throat of bacillary and one of non-bacillary origin, the term *toxæmia* is employed to represent the systemic effect of a specific *intoxication*, characteristic of the first, as distinguished from the *general septic infection* to be observed in cases of pseudo-membranous sore throat, associated with micrococci.

The **history** of diphtheria may now be dated from the period when Klebs of Zurich discovered the specific bacillus of the disease. This was in 1875, and the fact was published in that year at a medical congress held at Wiesbaden. Klebs, however, failed to establish the causal relationship of the micro-organism to the disease. This was effected by Löffler in 1884, as has been described at page 213, in Chapter XI.

There have always been, and still are, a few opponents to acceptance of the view that the Klebs-Löffler organism is the absolute exciting factor of diphtheria. The main objections are—

1. The occasional absence of the bacillus, and its frequent association with other bacteria in cases of diphtheria.

2. That the bacillus is *never found alone.*

3. That the bacillus is to be found in diseases not identical, either clinically or anatomically, with diphtheria.

Each and all of these objections can be met by the admission already made, that the term diphtheria possesses a bacteriological as well as a clinical signification, one or the other of which may exercise a preponderating influence.

It is now many years since Jacobi of New York expressed his conviction that many of the cases of so-called 'follicular tonsillitis' are of diphtherial origin and nature, and claimed also that the 'herpetic angina' of the French is in many cases nothing but diphtheria. At that time I thought this view was exaggerated, and it is still unrealised by the older school of physicians, and by not a few of the new; nevertheless, in the light of recent information, and especially that furnished by Biggs and Koplik, it must in fairness be admitted that the circumstance is of more than exceptional occurrence. The subject has received attention in the chapter treating of inflammation of the tonsils.

It may, however, once more be remarked that the clinical course of the disease in such cases is, for the most part, a mild one, and then conceding that the bacillus of diphtheria may be found in inflamed throats of the adult without producing any serious effects, it has to be noted that, on the other hand, the opposite sequence may be observed when diphtheria follows on scarlet fever, measles, or other exanthemata, more especially in the young, and that in these circumstances the implanted malady almost invariably assumes a highly malignant type. Dr. Albert Wilson appears to believe that a coccal infection generally precedes that of the specific bacillus—an opinion confirmed by Dr. William Hunter, who says that 'diphtheria is the result of a mixed infection.' But this is not always so.

From all that has been stated on this head it appears safe to assert, from figures at our command, that the proportion of cases of membranous sore throat of high grade occurring in the fauces which are not bacteriologically diphtherial does not exceed 10 to 15 per cent. of the whole number of cases reported, this being the proportion assigned by Billings when the larynx is attacked. A point worthy of note is that diphtherial throats are almost always dry throats, whereas purulent sore throats and those accompanied by much expectoration are almost always of coccal origin or with coccal complications, and the same occurs in the larynx.

The Klebs-Löffler bacillus.—The specific micro-organism of diphtheria is for the most part represented as a non-mobile, straight or slightly curved rod, generally exhibiting some clubbing at one or both ends. In addition to the slight single curving, it has sometimes a tendency towards a double curve, like the old-fashioned letter *ſ*, but this may possibly be due to the refractive

property of the organism, the ends staining more deeply than the other parts.

Each bacillus is from 1.5 to 6 micro-millimetres in length and 0.5 to 0.8 of a micro-millimetre in thickness; thus, it is both longer

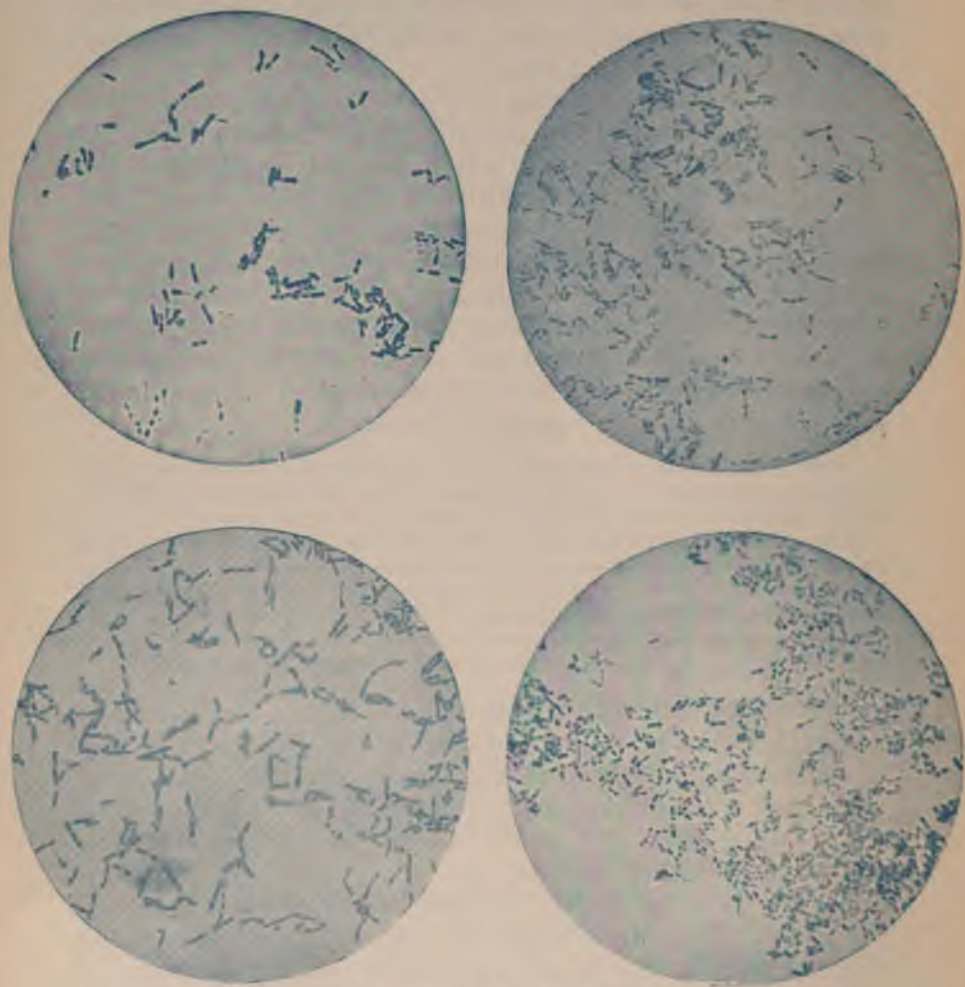


FIG. CCXXVII.—TYPICAL EXAMPLES OF THE KLEBS-LÖFFLER BACILLUS.

and broader than the bacillus of tubercle. Great variation in morphology is exhibited; thus the outline is not uniformly cylindrical, a bulging being often seen at the ends, while, when stained, a certain granular or segmented appearance is noticed in the interior. This was at first considered as evidence of the presence of spores, an erroneous conclusion now no longer held. Some-

times patches of the protoplasm appear as if shrinking from the cell wall, leaving a more or less regularly uncoloured or but lightly coloured space at the periphery. The bacillus stains well by Gram's method, and with Löffler's methylene blue.

The organisms occur either singly or in pairs, frequently more or less parallel to each other, or at an angle, like a circumflex accent (∧), seldom or never end to end or chain-like. They are sometimes arranged in small groups of three or four, often in such a manner as to bear close resemblance to letters of the alphabet, such as V, M, N, X, Y, or other forms of wedge-shaped character.

Several varieties of the bacilli have been described according to their size, namely, the *long*, the *short*, and the *medium*. They have been also variously described, according to their diameter, as *thick* and *thin*.

These dimensional differences in length and thickness probably represent varying degrees of growth and development, for as yet there is no definite evidence that length or thickness has any relation to the degree of virulence of the bacilli.

Of **pseudo-bacilli** may be mentioned the following:—

1. The attenuated or non-virulent bacillus, often to be found in company with active bacilli.
2. Hoffmann's bacillus.
3. The Xerosis bacillus observed on the eyelids in certain cases of exudative, but non-diphtherial conjunctivitis.
4. *Bacillus striatus albus.*
5. *Bacillus striatus flavus.*
6. *Bacillus ulna* of Vignal.
7. *Bacillus buccalis minutus* (*Bacillus G.* of Vignal).

Complex or cocco-bacillary diphtheria.—In the definition it has been stated that diphtheria is to be considered *pure* or simple when the Klebs-Löffler bacillus is the sole organism present in the cultivations, but when associated with other micro-organisms —*e.g.* cocci—it may be termed complex, *impure*, or cocco-bacillary diphtheria.

The micrococci which are of importance from a clinical point of view, as associated with the specific bacillus, are of four kinds:—

(1) Diplococci,—those arranged in pairs.
(2) Tetragoni,—those arranged in parcels of four.
(3) Staphylococci,—those arranged in grape-like groups.
(4) Streptococci,—those arranged in chains.

These micro-organisms have already been discussed in the chapter treating of the Bacteriology of Diseases of the Throat. It

only remains to say that Roux, in common with most of the French school, is of opinion that the presence of other micro-organisms with the diphtheria bacillus, especially streptococci, adds to the gravity of the malady. Kanthack, however, states that 'personal observation leads him to believe that the presence of streptococci in itself does not influence the prognosis,—indeed, they are rarely found absent, whether the cases be mild or serious'; while others do not consider 'the association with streptococci as evidence of unfavourable import.' My own experience, while not confirming Roux's conclusions as to the universality of ill omen of mixed infections from a prognostic point of view, has convinced me that no case of diphtheria can be in any way the better in that it is mixed, because, to its own specific toxæmia, are added the dangers characteristic of coccal infections.

Etiology.—Since the discovery of the specific bacillus it may be fairly said that diphtheria does not originate *de novo*.

There is no evidence that the disease is limited to any particular country, geological stratum, or even to any particular climate within the extremes of heat and cold. Nevertheless, it may be broadly stated that it is more prevalent in places where the surface soil favours the retention of moisture and organic refuse.

It is now generally admitted that the season at which epidemic sore throat is most frequent is that at which diphtheria is most prevalent.

An interesting example of the liability to draw false conclusions with regard to the influence of the weather on diseases of the throat is afforded in a report issued by one of the London medical officers of health for the exceptionally dry summer quarter 1893, in which belief was expressed that an increase which had been observed of cases of throat-inflammation of an unsanitary type, consequent on long-continued drought and heat, was referable, *first*, to the wind-carrying of dried pathogenic organisms in the form of dust, and, *secondly*, to the want of proper flushing of sewers.

I was, however, able to show by figures compiled on a large scale that it is *not during* dry weather that throat diseases of this character are most prevalent, but on the *first occurrence of a light rainfall* after a prolonged period of heat and drought; in other words, that the epidemic wave seems to be greatest when the first rainfalls, especially if slight, are sufficient to stimulate the dry and comparatively inert organic matter to activity, and that the prevalence only diminishes or disappears with the thorough flushing of the sewers consequent on heavier and longer-continued showers.

During the last forty years sanitation in city, town, and country has been greatly improved,—in many instances almost perfected,—and the death-rate from zymotic diseases has been considerably diminished. This reduction has been most marked in the case of enteric fever, a disease universally recognised as

depending on defective sanitation, polluted water-supply, and bad drainage.

It is an unfortunate, and at present unexplained, fact, that diphtheria, which, in its early history, appeared to be endemic or epidemic, chiefly in the rural districts, now invades towns and cities equally; moreover, each year, the mortality from this cause becomes steadily greater. But it must be taken as accepted that all forms of epidemic sore throat may be aggravated—even if they are not actually caused—by unsanitary surroundings.

It has been denied that such causes are sufficient to produce diphtheria. This may be so, but it may with equal confidence be asserted that they at least render a population, as well as an individual, more liable to the implantation and growth of the specific organism of the malady,—so much so, that, as Sir George Johnson has aptly said, 'not to recognise the frequent filth origin of diphtheria may in practice be as disastrous as to ignore its infectiousness.'

It has been already hinted that a sore throat, from whatever cause, is a peculiarly favourable site for the reception and development of the diphtheria bacillus, and that some individuals are particularly liable to such affections when exposed to drain-emanations, sewer-gas, or offensive effluvia from other sources.

It is therefore certain that such non-hygienic conditions must have a considerable influence on the development of diphtheria. And I found that in abstracting fifty English Local Government Board reports, constituting all those published on the various outbreaks of diphtheria in Great Britain that have occurred between the years 1882 and 1896, in forty-six—*i.e.* in ninety-two per cent.—there were undeniable evidences of defective sanitation, although in thirty-one only, or sixty-two per cent., was the origin of the outbreak definitely assigned by the medical inspector to have been due to this cause.

In connection with foul emanations as a cause of diphtheria, Lewis Smith and others have drawn attention to the evils resulting from the exposing of children to infected sewer-gas; for sewers are now ventilated on the street level, and children have a disposition to play about the gulley-holes. These facts may in some measure be responsible for the increased prevalence of diphtheria in urban over rural districts, the converse, as already stated, having been formerly the case.

The question of infection through schools is also another point that has occupied much attention.

To the various predisposing causes of diphtheria there is no

occasion to refer further, with one exception, namely, that of the **constitutional state** of the individual. And first in importance we must place that constitutional state which tends to produce obstructions to the free nasal respiration. The chief cause of this condition is enlargement of the faucial tonsils and hypertrophy of the lymphoid tissue in the naso-pharynx, which is now known as 'adenoid vegetations' (see Chapters XV. and XVII.).

A long experience leads me to the conclusion that it is rare to find diphtheria attacking a child under seven years of age unless he or she be the subject of one or more, probably both, of these forms of glandular hypertrophy. In a large proportion of young adults who contract diphtheria it is very common to find tonsillar enlargement, and the same has been noted in hospital nurses who have taken the disease. On the other hand, cases are not wanting to prove that removal of these obstructions to free nasal respiration appears to have conferred a special immunity to the disease on those who submitted to the operation. Lastly, in one thousand consecutive cases of diphtheria tabulated by me, the exudation was noted to be limited to the tonsillar region in six hundred and sixty-six cases, and in only eight out of the total number was it not implicated. That this region was the site of the disease in ninety-nine and two-tenths per cent. of the cases is a fact, the importance of which, from the etiological aspect, cannot be disregarded.

There is yet one item in the etiology of diphtheria which deserves mention, namely, the conveyance of the disease from animals to man; but, the chain of evidence in favour of such a circumstance has in the last few years been rather weakened than strengthened.

The toxic products of the diphtheria bacillus.—The causal relation of the specific bacillus of diphtheria to the disease having been established, it still remained a moot point to what extent the manifestations of the malady could be attributed to the presence of the organism in the membrane, until 1889, in which year all doubt was cleared up by experiments which scientifically determined the process, and established the fact that all the symptoms of diphtheria, except that of the development of membrane locally, are caused by the action of a definite poison.

Chief among the workers in this interesting field of research are Roux and Yersin, Hankin, Brieger and Fränkel, Sidney Martin, and Klein.

It may be here permitted to recall the circumstance that, in the interval between the discovery of the bacillus and that of its power to produce toxins, I, in the second edition of this volume published in 1887, ventured, on clinical grounds, to make the suggestion, which was at the time adversely criticised, that the principal cause of death in diphtheria was a poisoning of the system by fermentative products of the special organism.

However that may be, the products are capable of inducing all the symptoms of diphtheria except the membrane. Their toxic potency is reduced by exposure to a temperature of 58° C. for two hours, and is totally destroyed if submitted to a temperature of 100° C. for twenty minutes.

The views as to the nature of these toxic substances are various, and sometimes contradictory. Roux and Yersin have inclined to the belief that the poisonous material is an enzyme; Brieger and Fränkel have thought it to be a toxalbumin or a mixture of toxalbumins. Sidney Martin thinks that an enzyme is liberated by the bacillus, and that this digests the proteids of the body or of the culture-medium, and thus forms toxic albumoses, the latter producing the characteristic morbid changes. Uschinsky and Buchner regard the bacterial poisons as direct products of the bacterial elements. In the present state of our knowledge we cannot definitely say whether the toxins themselves constitute the poisonous element, or whether they produce poisonous enzymes. The diphtheria toxins do not all originate in the membrane, nor do the albumoses merely accumulate in the tissues; but probably the digestion of the body-proteids, by the action of the enzyme absorbed from the membrane, forms the toxin. These poisonous substances are of two kinds, namely, albumoses and an organic acid, which are responsible, by their action on the nervous system, for all the symptoms—the fever, the cardio-respiratory asthenia, albuminuria, and paralyses.

Klein has pointed out that 'a definite distinction is to be drawn between the poisons which may be present in the bacteria themselves and the poisonous substances liberated or elaborated by these organisms.' For he has shown that when certain micro-organisms are injected into the peritoneal cavities of rodents they produce symptoms of poisoning without any of their metabolic products being present. Moreover, if the microbes are killed by heat at a temperature of 70° C., previous to their injection, these dead bacteria in certain cases produce the same poisonous effects

as the living organisms. It is therefore claimed that these micro-organisms must contain a poison in their own substance.

The action of the toxins.—When these first products of the bacillary action are introduced into the animal body, they produce a local œdema, which subsides at the end of thirty-six hours and is not followed by any destruction in the tissues, although some irregularity in temperature and, in the case of rabbits, distinct febrile conditions are found to follow the injection; the blood becomes darkened and more fluid, and its coagulation is retarded.

Larger doses produce a fatal result from **paralysis** or **coma,** but it is worthy of notice that more lasting and noxious results are obtained from small doses of the poison frequently administered than from a single large dose. The paralysis at its onset may be rapidly fatal in its effects, or its progress may be slow and protracted; in any case, it is always progressive. The paralysis is manifested primarily, and chiefly on the respiratory apparatus.

The heart-muscle is in all cases in an advanced degree of fatty and pigmentary degeneration, with inter-fibrillary small cell deposit—interstitial myo-carditis.

The voluntary muscles of the body are not by any means necessarily affected at the same time, those first impaired being the ones which of necessity are in constant use. In all cases impairment of activity of voluntary muscles is due to a degeneration of their nerve-supply. Although there may be at first no apparent atrophy of the muscles, yet the body-weight of the animal decreases steadily.

Neuroses.—In diphtherial paralysis both the sensory and the motor nerves undergo degeneration, the sympathetic system being also involved.

The change commences in the white substance of Schwann, which, rapidly breaking up, finally disappears altogether. Following on this the axis cylinder becomes ruptured,—**segmental neuritis,**—giving rise to well-marked Wallerian degeneration in the *nerve-fibres.* The *nerve terminals,* both sensory and motor, also share in this process, which is preceded by localised inflammatory changes—*peripheral neuritis.* All the nerve-fibres, however, may not be affected to the same extent, and some may still retain their power of conveying nervous stimuli to the muscles which they innervate. The muscles which are deprived of nervous supply undergo a process of fatty degeneration and atrophy.

The **albumoses** in diphtheria are, therefore, to be regarded as nerve poisons, which affect the peripheral nerves, and if adminis-

tered in small and continued doses produce degeneration, leading to paralysis of both motion and sensation.

It is to be borne in mind that these paralyses may occur early in the acute stages of the disease, or in the later stages, when they come under the head of sequelæ.

The **Organic acid**, when injected into animals, produces fever to a slight extent, but no paralysis. If, however, an animal be treated with several doses at intervals, the heart, post-mortem, shows well-marked fatty degeneration in the muscular elements, and some of the nerve-fibres exhibit stages of degeneration similar to, but of a less degree than, that produced by very small doses of the albumoses. From these observations the organic acid must be regarded as a nerve poison of a much weaker nature than the albumoses.

Histo-pathology.—The membrane of diphtheria, wherever found, presents the same details, exceptions being made for slight variations in the early stage, due to difference in the surface epithelium.

The excellent diagrammatic drawing (Fig. CCXXVIII.), borrowed from Hamilton, is typical. It will be seen that there are three zones or strata, two of which are formed of plastic deposit; a third, the deepest, consists of modified mucous membrane. The upper layers are new, and have replaced the epithelial covering. They consist almost entirely of coagulated fibrin enclosing leucocytes in its meshes, which are most numerous deeply; whilst in the superficial zone, highly charged with bacilli, they are but few.

It sometimes happens that in the earliest stage of the membrane formation the stratified epithelium may also present a network; this must not be mistaken for fibrin, as it is due to liquefaction and vacuolation of the epithelial elements. Coagulable plasma is soon, however, mingled with it, and the two become so blended that their separate identity is lost. Red blood corpuscles may frequently be recognised at different levels, but the inflammatory corpuscles predominate. These are, however, derived from the blood or lymph vessels, and multiply rapidly by karyokinesis. Their nuclei, while retaining a circular shape, present various groupings of nucleo-plasm peculiar to the process of mitosis. Other bodies, with much larger and oval-shaped nuclei, are seen in the deeper layers. These are probably derived from the endothelium of the blood and lymph vessels, or from the connective-tissue corpuscles. The blood vessels of the mucosa are not only dilated, but appear to be

more numerous whilst their epithelioid lining shows active proliferation.

It will thus be seen that the morbid process consists of two

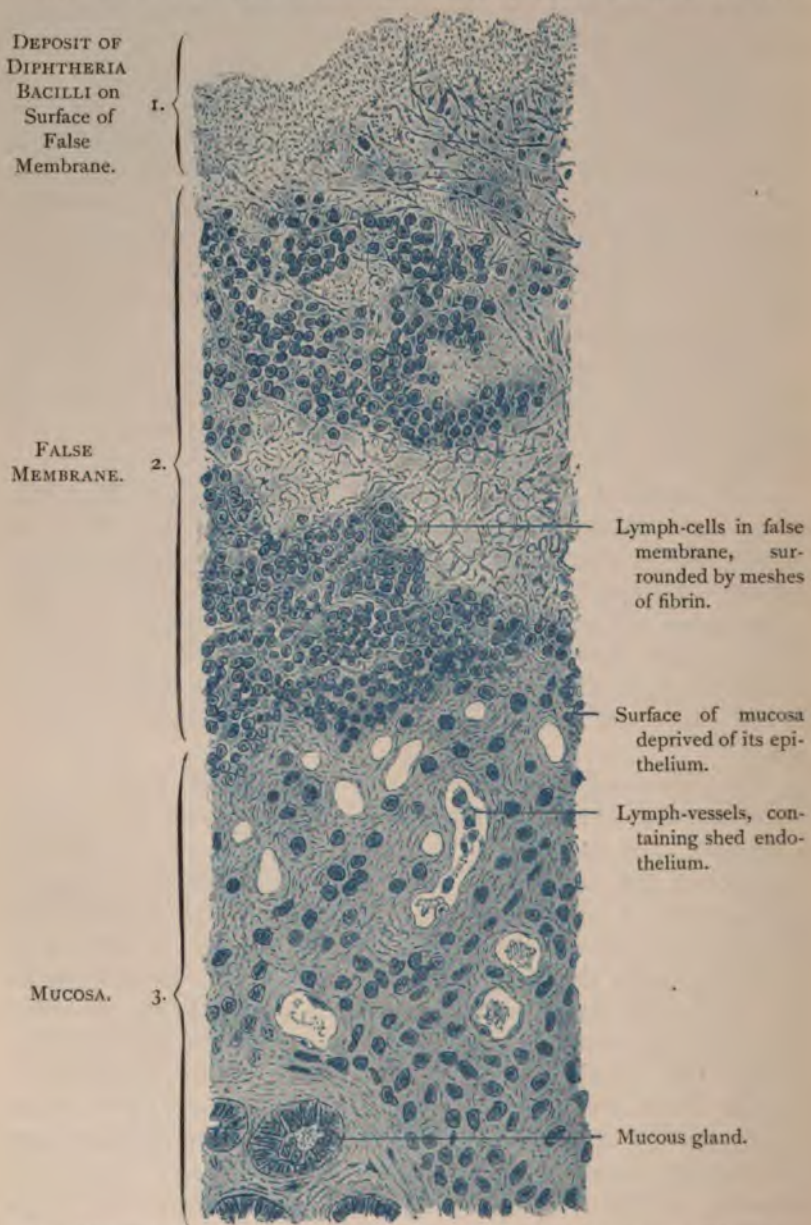


Fig. CCXXVIII.—Free Surface of Diphtherial Larynx (× 350 Diams.). (*After* Hamilton.)

distinct features—(1) a pouring out of plasma which, coagulating, forms a filamentous net-work, destroying and replacing the surface epithelium, coincidental with (2) the appearance of inflammatory corpuscles. — This superficial layer is filled with buccal microbes—mostly indifferent — along with distinct little heaps of characteristic Klebs-Löffler bacilli, some of which are also found imprisoned in the fibrin at a deeper level. The bacillus of diphtheria is found most abundantly in the superficial layers of the membrane (Fig. CCXXIX.).

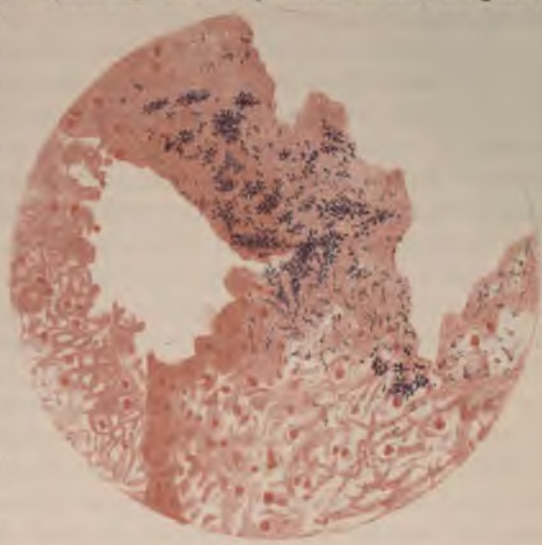


FIG. CCXXIX.—DIPHTHERIAL MEMBRANE (PURE). BACILLI *in situ*.

On the surface, as well as in the stratum, between the false membrane and the denuded epithelium, the *Streptococcus Pyogenes* and *Staphylococcus Aureus* and *Albus* are also very frequent companions of the bacillus (Fig. CCXXX.), and these organisms may travel into the deeper tissues, lymphatics, and blood-vessels when they constitute the cause of

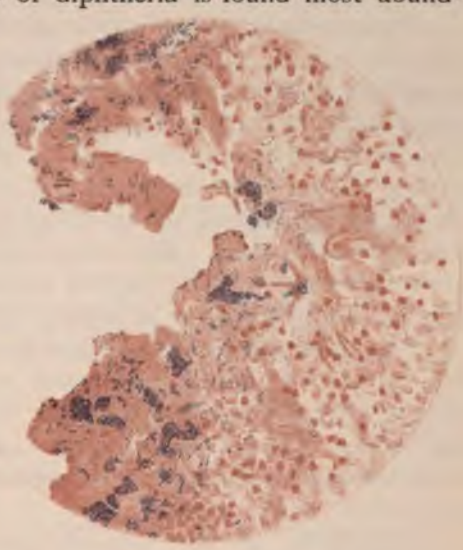


FIG. CCXXX.—DIPHTHERIAL MEMBRANE (COMPLEX). BACILLI AND COCCI *in situ*.

secondary infective processes in the lymphatic glands, lungs, spleen, and other organs.

The mucous membrane itself is also invaded by the exudation, and the coagulation process extends deeply into the submucous layers, which become infiltrated with small inflammatory cells, leucocytes, and micrococci. By this process the membrane becomes progressively firmer and tougher by each fresh deposit from beneath. Thus, the external or upper layer of the diphtherial false membrane, which is oldest, is thrown off when it becomes disintegrated, in the form of a slough, exposing a surfacc eomposed of torn capillaries, and closely packed inflammatory corpuscles, mingled with and obscuring the mucosal elements.

When stained *in situ* the bacilli are often seen to be arranged in small groups of three and four, forming angles with one another, a peculiar feature which has been already mentioned, and is of the greatest value in identification. When the malady marches towards cure, the bacilli diminish in number, and very often disappear with the membrane. On the other hand, they may persist long after the individual is apparently cured. With regard to associated organisms, staphylococci are generally the last to disappear.

Pseudo-diphtherial membrane due to coccal infections is characterised by an excessive exudation of plasma which, on coagulation, forms a net-work of delicate strands and fibres, enclosing in its meshes leucocytes, granular débris, and pus-cells. This false membrane is attached by thin fibrinous threads to the surface of the tissue beneath; but, being only loosely adherent, can easily be stripped off, revealing a hyperæmic, but not, as a rule, a bleeding base. The necrotic process does not involve the entire epithelial surface, for, on removal of the exudate, some patches will be found to be normal in character and unaffected.

As extravasations of blood into the interstices of the membrane are exceptional, pseudo-diphtherial exudation rarely presents a brown or black colour, but is usually of a whitish-yellow or greyish appearance. The absence of the specific bacillus in the coccal varieties of membrane forms the criterion of differentiation from that which is truly diphtherial.

Diphtheria has been regarded as primarily a local infection, because the bacilli are found chiefly at the seat of infection, namely, in the false membrane. In fact, in the early history of this subject, the bacillus was not found in the blood-vessels, lymphatics, or internal organs, and this was accepted as decisive

evidence that its pathogenic action must be localised on the surface; whence arose the idea that the systemic infection was due to a chemical poison generated by the specific microbe. But it is now known that the bacilli may escape from the site of the first deposit and find their way into the vascular system or into the lymphatic vessels, by which channels they may invade the spleen, kidney, lung, etc., or the various lymphatic glands.

Frosch (1893) and Wright (1894) discovered the Klebs-Löffler bacillus in the lungs and spleen; later, Bulloch and Schmorl (1894) found it in the submaxillary, bronchial, and mesenteric glands, and, still more recently, Kanthack and Stephens (1897) have confirmed and verified the accuracy of these researches by independent investigations.

The mortality, when there is true diphtherial infection of the lung, spleen, and other organs, is, according to the last-mentioned authorities, exceedingly high, and in almost every case in which the larynx is involved and tracheotomy becomes a necessity, the diphtheria bacillus can be demonstrated in the lungs. In some *rare* instances diphtheria is found on the lining membrane of the *œsophagus, stomach, intestines, rectum*, and even *gall-bladder*. Very exceptionally it starts in, or is limited to, certain of these parts. Specimens illustrating diphtheria of *Peyer's patches*, which may be taken as homologues of the tonsils, have quite recently been added to the Museum of the College of Surgeons. I have more than once met with cases of two individuals dwelling in an unsanitary house, the one of whom has had typhoid and the other diphtherial symptoms.

CASE LXXXIX.—An example of diphtherial enteritis came under my observation in the year 1884. The patient, a general practitioner, was attacked with all the symptoms of intestinal obstruction whilst actively engaged in attending a large number of cases of epidemic diphtheria; marked asthenia was exhibited early in the disease, and the illness terminated in death from perforation and fæcal escape into the peritoneal cavity. At the post-mortem examination several diphtherial patches and ulcers were found in the small and large intestines. The real nature of the case was quite unsuspected till the autopsy revealed it.

CASE XC.—During the epidemic of diphtheria at Ealing in 1887, two cases came under my notice of sisters who, with others, were attacked in a school. One had, in common with other pupils, pharyngo-laryngeal diphtheria from which she recovered; the other had no throat symptoms, but died of perforative peritonitis—the result of diphtherial enteritis.

Hector Cameron, who confirms this experience, records also an interesting example of diphtheria, enteric fever, scarlet fever, and pneumonia, occurring in the same family and house (a very insanitary one) during a period of twenty-two months, and, to some extent, overlapping one another in point of time.

Membranous deposit—not always truly diphtherial—has been found on the *prepuce* of the male, and *vulvo-vaginal* tract of the

opposite sex. The exudation, however, only attacks the skin at abraded spots, such as eczematous fissures, operation wounds, leech-bites, and blistered surfaces.

Hill has recorded two cases of primary diphtheria of the perineal region, which occurred in a father and daughter. The disease was supposed to be contracted through using an unsanitary water-closet. The father, aged 40, had false membrane on an old eczematous patch near the anus, which was followed by typical paralysis. There was no false membrane in the throat. The daughter, aged 9, had some weeks afterwards primary diphtheria on the vulva, which spread to the vagina and perforated the recto-vaginal wall. In this last case there was also false membrane on the throat which extended to the lungs, causing death.

Bacteriological Diagnosis.

The presence or absence of the **Klebs-Löffler bacillus** can usually be decided in a very short time by removing a portion of the membrane or suspicious exudate by means of a swab of sterilised cotton-wool, a platinum wire-loop, or pair of forceps. This small fragment of membrane is rubbed over the surface of a clean cover-glass, and the film so obtained is dried and stained with Löffler's blue staining solution, or, preferably, with Roux's combined stain of dahlia violet and methyl green.

The cover-glass, being prepared, is mounted in the usual manner and submitted to microscopical examination. The bacilli should at once be recognised, if present, by their typical characteristics. If bacilli are not found by the above method, a streak culture may be made on blood-serum, when the characteristic colonies of the diphtheria bacillus will, if present, be evident after an incubation of twenty-four hours at a temperature of 37° C. Moreover, the presence or absence of other organisms—*e.g.* strepto- staphylo- or diplo-cocci—may be determined, after more than twenty-four hours have elapsed, by the appearance of colonies which are characteristic of each.

Finally, the microscope will confirm the diagnosis and establish the presence or absence of any particular form of micro-organism which may be present in the particular cultivation.

Presuming that our colonies have developed, how are we to know that they are those of the diphtheria bacillus?

1. By the rapidity of their appearance.
2. By their size and optical characters.
3. By the grouping of their colonies.
4. By the condition of the serum in which they are cultivated

After the culture-tubes have been in the incubator at a temperature of 35° to 37° C. for fourteen or eighteen hours,

colonies of the diphtheria bacillus appear as whitish grey specks, each about the size of a pin-head; the contour is regular and the surface dry. By transmitted light the centre of the colony is seen to be thicker and more opaque than the periphery, which is translucent.

This establishes an almost positive diagnosis of the presence of the diphtheria bacillus,—that is to say, a positive naked-eye diagnosis has been obtained.

The **streptococcus** is of much slower growth, and its colonies may be distinguished from those of the bacillus by the fact that they do not begin to form until the lapse of at least twenty-four hours. They appear as white colonies, very much smaller than those of the bacillus, resembling, as compared to the pin-heads of colonies of the latter, so many pin-points.

The **staphylococcus**, although more rapid in development than the streptococcus, resembles it in its slow rate of growth as compared with that of the diphtheria bacillus; its colonies are much larger than those of the bacillus diphtheriæ. They are of a flocculent or snow-white appearance, darker in the centre, but thinner at the edges, and the halo-like effect at their periphery is somewhat greater than that seen in a colony of the Klebs-Löffler organism. These colonies often take from two to three days to develop properly. A yellowish or golden tint may appear in some cases, but it is by no means either an early or a constant occurrence.

Preference is given to blood-serum as a culture medium, because the diphtheria bacilli grow more rapidly and preserve more of their special characteristics than when cultivated on other media.

The practitioner must be cautioned against accepting too readily a negative diagnosis as decisive; for not every bacteriologist, any more than every practitioner, is equally gifted with either perfection in making his preparations and cultures, or accurate interpretation of the evidence they may afford. Added to this, the swab employed to remove the secretion may not always reach the site of the bacilli.

Clinical Diagnosis.

Those who have not been in the habit of comparing what can be seen at the bedside with the results to be obtained in the bacteriological laboratory will be surprised to find how much confirmation, or it may be correction, the one is capable of

affording to the other. Many illustrations have been already given, and it will be from this aspect that our remarks on diagnosis will be based.

The diagnosis of the malady, as its name suggests, rests mainly on the presence of a false membrane; but membranes—at first sight very similar to those of true diphtheria—may result from the action of various irritants, such as strong acids, ammonia, eau de Cologne, scalding water, caustics, etc.

The bacteriological test is therefore held to be essential.

It is worthy of note that the membranous inflammations of the throat exhibited previously to or during the early stages of any of the exanthemata are not, as a rule, of the nature of true diphtheria; while such as are implanted on them in defervescence or as sequelæ, are almost invariably proved to be absolutely of that nature by the presence of the Klebs-Löffler bacillus.

In many cases these doubts can be solved, in a large degree, by a careful comparison of the symptoms, both physical and functional, of those membranous sore throats which are characterised by the micro-organism recognised as specific of diphtheria, either alone or in association with cocci, and by due recognition of other more special evidences of the different diseases in which they are found.

The following are the particular points to which attention may be usefully directed:—

Age.—I have long ago insisted on a fact which must appeal to the experience of most practitioners, that while *membrane is the almost constant characteristic of acute inflammatory affections of the fauces and larynx in infant life*, its absence is to be frequently noted in similar cases occurring in persons of full age, and, curiously enough, it is seldom to be seen in infants at the breast, though even in the newly-born the system may be infected with the specific toxæmia.

The following analytical table of one thousand consecutive cases shows the frequency and mortality of diphtheria according to age:—

MALES AND FEMALES.

Age.	Number of Cases.	Deaths.	Mortality Per Cent.
Under 1 year . .	5	3	60
Under 5 years . .	402	181	45
Between 5 and 10 years	316	83	26.2
Between 10 and 15 years	102	12	11.7
Over 15 years . .	178	7	3.88

It is thus seen that in these one thousand cases the occurrence of diphtheria in patients under one year of age was 0.5 per cent.

An analysis of nearly six thousand cases demonstrated the frequence as not exceeding 1.5 per cent. The youngest patient in whom I have seen diphtheria with membrane was six weeks of age.

The degree of inflammation present in the throats of patients attacked with pure diphtheria is of a lower grade than that of throat manifestations in connection with scarlet fever or measles.

I believe from my own experience, although my opinion has been contradicted, that œdema of the uvula and velum is an indication of the malady being non-diphtherial, or at least of a mixed character. I have never seen it in the case of a pure diphtherial infection.

A point worthy of note is, that unmixed diphtherial throats are almost always dry throats, as likewise are the cultivations of the diphtheria bacillus on blood-serum. An excess of mucus or saliva always suggests a coccal infection or complication, and the same may be said of local suppurations.

As to the site of the membrane,—

From the following table the relative frequency and mortality of site in one thousand cases will be at once apparent:—

Part Affected.	Number of Cases.	Mortality Per Cent.
Fauces (alone)	672	12
Larynx (alone)	4	25
Nostrils (alone)	2	50
Fauces and larynx	109	43.7
Fauces and nostrils	165	64.2
Fauces, larynx, and nostrils	46	61.2
Labial or buccal *only* (involving 6)	1	33.3
Hard palate *only* (involving 12)	1	91.6
	1000	

Faucial.—The tonsils were the sites in all the cases where the situation is described as that of the fauces, and this disposition to attack the tonsillar tissue is evidenced in the whole tonsillar ring except, perhaps, in the lingual portion.

It is a peculiarity of the diphtherial exudation to start on some little prominence such as the uvula, the free edge of the epiglottis, on the eminences of the cartilages of Wrisberg and Santorini, or in some small recess as in the lacunæ of the tonsils.

Laryngeal.—The frequency of laryngeal extension, as shown in the foregoing table, is doubtless underestimated, for the laryngoscope was not used to aid the diagnosis in these cases. It is a matter of regret that in these days, when the art of laryngoscopy is so generally cultivated, it should be so seldom employed in cases of suspected diphtheria of the larynx. For by its aid diagnosis would be rendered more complete, and intra-laryngeal treatment being more early adopted, a better chance of life would be given to many a patient. In the case of intubation, both introduction and extraction of the tube would, by the aid of the mirror—an easy matter when the mouth is propped open—be accomplished with greater accuracy and speed (see p. 542).

Nasal.—When the nares are involved the mortality is so high that an attack so characterised has been aptly called 'malignant diphtheria'; indeed, in the one thousand cases tabulated in the foregoing table the death-rate amounted to 63.4 per cent.

Diphtheria but rarely invades the nares primarily, and is limited to that situation,—only two in one thousand cases are here recorded; but nasal diphtheria, as represented by an extension of the exudation from the pharynx, occurs in 21.3 per cent. of all cases.

It may, indeed, be generally stated that the nares are, as a rule, involved when membrane is exhibited on the posterior surface of the uvula. Its presence is further indicated by a nasal discharge, which is usually of a peculiarly fœtid, sanious, and irritating character, causing excoriations and sores round the nostrils and on the upper lip. The fœtor of the flux in the case of diphtheria is of itself quite distinctive, for it is never to be observed in cases of ordinary acute endo-rhinitis or coryza; so that this symptom of foul odour has led to the adoption of another synonym of diphtheria, 'putrid sore-throat.' The discharge is often tinged with blood, which symptom is occasionally intensified by sudden and profuse attacks of epistaxis. This form of the malady is always to be regarded as of the gravest import, since systemic infection rapidly ensues, and fatal prostration, asphyxia, and pulmonary complications are almost certain to follow. It is important to remember this, because the contrast has been laid down by more than one recent writer on rhinology, the error arising on an assumption that *rhinitis fibrinosa*—a subacute and mild affection—is always diphtherial.

The reason for the exceptionally intense toxæmia of nasal diphtheria is to be found in the fact that the nasal passages offer, more than any other site, both in their extensive area and readily

absorbent surfaces, as represented by the turbinals, the very conditions most favourable for the production of toxic enzymes. In fact, the arrangement of the apparatus employed in the laboratory for the manufacture of the toxins bears a striking resemblance to that of the contents of the nasal cavities. It may here be noted that in one case of nasal diphtheria, under my observation, death ensued from meningitis; the autopsy proving absence of aural or other possible infection. The circumstance offers yet another illustration of the gravity of nasal diphtheria, in its liability to direct cerebral infection through the cribriform plate by a similar process to that which has been observed in regard to cerebro-spinal meningitis, whereby the specific organisms have been demonstrated post-mortem to have found their way to the anterior meninges.

Bacteriological examination of the membrane from the nasal cavities demonstrates that the disease is always of a 'mixed' nature. The associated organisms are most frequently streptococci of various degrees of virulence agreeable to the severity of the local evidences. The exudate may in some cases be discharged from the nares as a large plug taking the shape of the turbinals, with their corresponding choanæ. In others, shreds of membrane may come away, but in the majority of cases the fluid discharge is the main feature, and any argument to the effect that the disease is not diphtheria, because no membrane is either seen or liberated, is based on ignorance of this fact. In the newly-born, membrane is rarely seen; and it has been even asserted that children at the breast are immune to the disease, but Riether of Vienna, with a large experience in a children's hospital, has exposed this fallacy. He says that the manifestation in young children is practically almost always primarily nasal, the acid contents of the mouths of sucklings preventing the growth of the Klebs-Löffler bacillus.

However that may be, infants are certainly susceptible to the toxins of the malady, and I have seen more than one case in which the wasting and death of a previously strong child at breast, exposed to the infection, could only be so explained.

When the nasal discharge is sanious and very irritating, the streptococci are found in large numbers, and are usually of the most virulent form, especially in those cases where profuse epistaxis is a prominent symptom.

In purulent and sanguineo-purulent discharges I have also found staphylococci. In one case diplococci were discovered, and the presence of these organisms would suggest or confirm a diagnosis of pulmonary complication. Extension of the inflammation along the Eustachian tubes is not uncommon, although by no

means so frequent as in scarlet fever or measles, even if allowance be made for the relative frequency of the two diseases.

The *Aural* complication of diphtheria, unlike that of these last-named exanthemata, does not appear to be characterised by a great degree of pain, nor is its prognostic importance from meningeal inflammation or mastoid suppuration great, although cases of periostitis, which have acquired relief by incisions, do from time to time occur. It is not out of place to mention here that among the *sequelæ* of diphtheria, deafness, both in the middle and internal ear, is sufficiently frequent to occupy our prognostic consideration.

Experience of non-diphtherial purulent otitis would lead one to expect that in diphtheria the staphylococcus would be the most commonly associated organism of the bacillus; but in the few cases I have examined of diphtherial discharges from the ear the streptococcus has been found quite as frequently, and even more abundantly.

Ocular.—In some instances, rare though they may be, the inflammation may pass from the nose along the lachrymal duct to the eye. In other cases the bacillus may become implanted on the conjunctiva directly. Children who are suffering from simple conjunctivitis, or from granular lids, are very liable to contract diphtheria when exposed to infection, the malady having a decided preference to attack surfaces already inflamed. True diphtheria of the conjunctiva is a serious complication, and often results in permanent opacity of the cornea, and in even total destruction of sight.

Some of the mild cases are probably due to the Xerosis bacillus, and are not truly diphtherial.

Adenitis.—Enlargement and tenderness of the lymphatic glands in the neck is not only a very early and constant symptom, but is also one of considerable diagnostic value. It may precede the appearance of the membrane in the throat, or may indicate its presence in some part not visible on examination. To a certain extent the amount of glandular enlargement is proportionate to the virulence of the disease, but there is a distinct difference in the portion of the glandular region affected.

In *pure diphtheria* the **cervical glands** are those mostly attacked. This may be in the form of enlargement and tenderness of the whole chain of glands, which can be separately felt, or, in the gravest cases, as one large swollen mass in the neck, in which the **parotid** may also be involved.

In *complex diphtheria*, both the **cervical** and **submaxillary**

glands are affected, and in *coccal diphtheria*, where streptococci are predominant, of which scarlet fever is a striking example, the **submaxillary** glands are those most frequently affected. In diphtheria following scarlet or other specific fever,—in other words, when streptococci are associated with the diphtheria bacillus,—both sets of glands are inflamed concurrently.

Adenitis is far more common in scarlet fever than in diphtheria; indeed, it may be taken as one of the ordinary symptoms of the former disease. It is far more intense, and suppuration, to which it is also more prone, takes place at a much earlier date. Nevertheless, suppurating adenitis and cellulitis are far more frequent in true diphtheria, especially in the mixed form, than is generally taught, for this complication—or, as it may almost be termed, this sequela—was found in 9.75 per cent. of my one thousand cases.

The clinical diagnosis of diphtheria depending, as it does, so greatly on the presence of false membrane in the throat, makes it necessary to devote a brief space to consideration of the different forms of pseudo-membrane which occur in other acute specific fevers, and the signs by which they may be distinguished from that of diphtheria itself, typical illustrations of which are given on PLATE VII.

The membrane of diphtheria varies much in its colour, from that of white, faintly tinted with a pearly grey or lemon, to deep greyish green, brown, or almost black, the intensity of hue depending partly on the age of the exudate, and largely on the amount of blood extravasated.

Fig. 58, in the Plate, represents what may be called the gradual and creeping type, and also the circumstance that the membrane generally commences as a fine, semi-translucent, pellicular exudation, increasing to a thick, opaque membrane, the density of which is, however, variable. A form quite as frequently seen, and more characteristic of the name which has been given to the disease, is shown in Fig. 60, in which the exudate from the first is plastered on the tonsils as if 'laid on with a trowel.'

Fig. 59 is representative of the hæmorrhagic variety, in which the pseudo-membrane is always of a more dusky hue, owing to its admixture with extravasated blood.

DIFFERENTIAL DIAGNOSIS.

Scarlet Fever.—False membrane on the *fauces* is rare in scarlet fever throats. The exudation in such cases is yellowish

in colour, dirtier or greyer than in the early stages of diphtheria. As shown on Fig. 62, PLATE VII., it tends to become pulpy, pultaceous, or purulent, and to leave deep and destructive ulcers, producing characteristic and unhealing perforations in the pillars of the fauces. Scarlet fever is responsible for suppurative inflammation of the *middle ear*, this event being attended by great pain, and liable to extend to the mastoid antrum and to the meninges. Otorrhœa is a less frequent complication of diphtheria, is not as a rule painful, and is less obstinate to treatment. No membrane is present in the nose in scarlatina, but there is often a purulent discharge. *Epistaxis* is not rare, and hæmorrhages from the throat, as the result of destructive ulceration, are also by no means infrequent. In fact, this tendency to bleed often constitutes a marked difficulty in making a satisfactory diagnosis of the exact condition of a throat in scarlet fever. The *larynx* is but seldom attacked as compared with diphtheria and measles, and when it is, the inflammation is usually of the nature of an acute œdema. The *temperature* is nearly always higher and the onset more sudden than in diphtheria. Lastly, the *rash*, which in scarlet fever is of almost constant recurrence and punctiform in character, is only occasional and erythematous in diphtheria. This of itself may often afford a conclusive criterion of discrimination.

Measles.—Membrane on the *fauces* is very rarely observed during the course of an attack of measles, although true diphtheria is not infrequently implanted on this exanthem as a sequel, in which circumstance the diphtheria is manifested in a very fatal type. *Coryza* is an early symptom, and great redness of the conjunctivæ is a well-marked feature. This is sometimes accompanied by manifestations of false membrane on the eyelids. Measles is particularly liable to be characterised by general implication of the air-passages. Hence we frequently find as a complication or sequel, *laryngitis*,—of an acute but non-membranous character,—*bronchitis*, and *pneumonia*. There is less tendency to severe suppuration and ulceration in the throat, but middle-ear troubles are very common, and usually commence as a sero-mucous inflammation, while those observed in scarlet fever are almost always suppurative in character, as they are also, but not so constantly, in diphtheria.

Typhoid Fever.—A certain amount of *pharyngeal* and *laryngeal* inflammation is not uncommon in enteric fever, and, if looked for, a *faucial* exudation, easy to be distinguished from aphtha, may be seen about the third week. Independently of the special

commemorative signs, the characteristic point about the throat is that the membrane does not become thicker, does not separate more easily, than in scarlet fever, and that it is characterised by the presence of staphylococci rather than by that of streptococci. Lastly, it is altogether of a milder nature. The characteristic course of the temperature, headache, diarrhœa, etc., in most cases materially assists in forming a differential diagnosis. It must not, however, be forgotten that true diphtheria sometimes, although rarely, supervenes on an attack of enteric fever.

Small-Pox.—In very severe cases of diphtheria, especially those in which the *nares* are the sites of membrane, *epistaxis* is a frequent symptom, thus resembling those which occur in cases of hæmorrhagic small-pox.

Exhaustive inquiries from superintendents of infectious fever hospitals prove that membranous exudation of the throat is practically unknown in small-pox, and has only been occasionally observed in the malignant form of this disease; in these rare cases, deep ulceration and necrosis, leading to œdema of the glottis, have occurred.

Varicella or *Chicken-Pox* is not likely to be mistaken for diphtheria. Its clinical appearances in the throat are depicted on Fig. 61, PLATE VII.

Non-Diphtherial Tonsillitis.—This affection of the throat, in its desquamative form, is perhaps that which is most frequently mistaken for true diphtheria, and therefore demands more than passing notice. Indeed, there can be but little doubt, as already mentioned, that many cases of lacunar tonsillitis—especially in the adult—are really, by the tests of bacteriology, diphtherial in an early stage, the true nature being only revealed subsequently by the characteristic paralytic sequelæ of diphtheria. The membrane—though it hardly deserves that title—in tonsillitis can be readily detached by the swab without any hæmorrhage. It consists mostly of necrosed epithelial cells; it is soft and friable, with a fœtid odour, and occurs in small, soft, rounded masses, very different from the firmly adherent fibrous exudation of true diphtheria. When the organism is a staphylococcus, the inflammation is always accompanied by much mucous secretion of a viscid, ropy, and clogging character (Fig. 63, PLATE VII.), diphtheria being a much drier affection of the throat.

The diagnosis is helped by the sudden onset, high grade of temperature, and, above all, the pain. Difficulty of opening the mouth and extreme dysphagia are also important symptoms of distinction in acute tonsillitis long before suppuration occurs.

Lastly, the exudation in tonsillitis is almost always confined to the tonsillar region, and does not spread to the fauces.

PROGNOSIS of diphtheria, whatever its form, is to be considered from both the bacteriological and the clinical aspects :—

(1.) **Bacteriological.**—The first point to determine is, whether the case is one of true or pseudo-diphtheria. The presence or absence of the Klebs-Löffler bacillus should decide this question.

Secondly, Is the specific bacillus associated with one or more of the cocci which have been shown to exert an influence on the character of the disease? If cocci are present, then the nature of those which predominate must be taken into account, and their significance must be duly considered according to their variety, numbers, and arrangement.

The general statement may be made that the less the Klebs-Löffler bacillus is associated with other micro-organisms the more favourable will be the prognosis.

My experience leads to the opinion that when streptococci are associated with the diphtheria bacillus, it may be predicted, if they are not already present, that enlarged submaxillary and parotid glands, phlegmonus inflammation of glands and tissues, broncho-pneumonia, nephritis, and other septic complications, will present themselves in the course of the malady, which, if they do not prove fatal, will materially retard recovery and convalescence.

The presence of staphylococci in large numbers is an indication that suppurative processes may be expected.

(2.) **Clinical.**—The prognosis of diphtheria is always difficult, and should in every case be a guarded one, for every epidemic of the disease differs in character and in severity of type; while wide ranges in virulence will be often observed in different members of the same household.

First, it is necessary to consider the *age* of the patient, for there can be but little doubt that there is an age disposition to diphtheria, as well as an age mortality. This is due to two causes, one of which is the disposition to nasal obstruction and enlargement of the tonsils (allusion to which has already been made in discussing the etiology of the disease), and another, the greater tendency in the infant to membranous exudations in all acute inflammatory conditions of the throat, quite irrespective of contagiousness, as compared with the submucous infiltration with œdema in analogous affections when they occur in the adult. There is also as much hypersensitiveness to diphtheria in the young as there is to scarlet fever, measles, and the like, which, moreover, are them-

selves so frequently the forerunners of an attack of diphtheria. And it is worthy of notice, in this connection, that in all epidemics of diphtheria, as well as in the large majority of sporadic cases, children are the first to be attacked. It is an interesting fact, that the liability to diphtheria in regard to age corresponds very closely with the age disposition of children to the enlarged tonsils and adenoids.

The prognostic data of any individual case should also be regulated with due regard to the *type of an epidemic*, as judged by other cases in the neighbourhood. The source of primary incidence and personal infection must also influence the forecast, for undoubtedly the virulence of a case may be modified in its intensity by such general and special circumstances.

The *character, amount, and extent of the false membrane* present in any individual case is also an important factor in the prognosis. The larger the surface affected, and the more abundant the exudation, the graver will be the forecast; for it must be evident that under these circumstances the prognosis is rendered more grave from the twofold point of view of increased mechanical obstruction to respiration, and the greater opportunity for the generation and absorption of the toxic products of the specific organisms present in the membrane. On the other hand, we know by recent bacteriological investigations that, although the membrane may be manifested in only very minute quantity, or even entirely absent as far as ocular inspection can determine, yet the specific bacillus may be present in the throat in its most virulent form, and for toxic reasons a grave prognosis would then be indicated.

The relative mortality of diphtheria according to the *site of the membrane* has already been considered, and it may be generally stated that when the surface involved is of large extent, the membrane very thick, of a fœtid odour, and with a tendency to become gangrenous, and, lastly, when associated with a foul discharge from the nose, indicating the presence of extension to the nasal passages, the case is one of great severity, and the prognosis is proportionately more unfavourable.

The mortality due to *nephritis* and its results, according to my table, was 2.7 per cent.; and more detailed examination would appear to show that there is some relation between this renal complication and nasal obstruction, which will readily be understood by those who recognise the influence of the last-named condition on the oxygenation of the blood. Moreover, the same trouble appears to indicate that the frequency with which sup-

pression of urine is associated with epistaxis is more than accidental.

A possible explanation for the frequency of nephritis may be found in the fact that a considerable proportion of cases of diphtheria follow on scarlet fever, in which, however, albuminuria occurs at a later date than in diphtheria, though in the latter it often continues long after disappearance of all throat trouble, and may be responsible for permanent renal mischief.

Among other elements of prognosis worthy of note may be named the *temperature*; diphtheria is not a high temperature disease. In 80 per cent. of my 1000 cases, the temperature did not exceed 101° F., and in 30 per cent. it was below 99° F. Elevations almost always indicate serious complications of inflammatory character, while *algidity* is sometimes observed where the asthenia is extreme. *Rigors* occasionally occur in connection with suppurative processes.

The chief characteristic of the *pulse* is its extreme rapidity in proportion to the temperature. Jenner has pithily said, 'An extremely rapid and feeble pulse is of grave import; a very infrequent pulse is of fatal significance.'

It is a peculiarity of diphtheria, apart from almost every other disease, that the exact date at which the patient can be declared 'out of the wood' is most variable and uncertain; for death often occurs suddenly after a comparatively mild attack, and at a period when the patient seems to be convalescent.

Mode of death.—Death from *convulsions* and *coma*, though rare, is mostly the result of uræmic poisoning. The possibility of cerebral complications must not be lost sight of. A peculiarity of the uræmia of diphtheria is the clearness of intelligence up to the moribund stage, or even up to cessation of life itself.

Sudden death may occur from suffocation, asthenia, cardiac, renal, pulmonary, neurotic, and other causes. In the first week it may ensue from obstruction to respiration and its consequences, either with or without operative interference, when the larynx is involved. Paralysis of the respiratory or cardiac functions may be responsible for a fatal termination at a quite early or at a later date. Again, the formation of a fibrinous clot in the heart or great vessels may lead to a sudden and unexpected end.

TREATMENT.—With the discovery of antitoxin, it was at first announced that all internal remedies must be abolished as needless and even harmful, and even local germicides were tabooed. It is now, however, generally conceded that no element

of treatment, whether constitutional, topical, or operative, can be ignored even by those who counsel serum therapy, and it is therefore necessary to give with full detail all the measures which were in use before its introduction.

General.—At an early date measures should be adopted to facilitate the elimination of the toxic elements of the disease by the excretory channels. For this purpose, at the onset of an attack, the bowels should be freely opened by the administration of calomel in the adult patient, or in the case of children, even though diarrhœa is a symptom, by the same drug, or by grey powder, preferably combined with small doses of antimony,—the old James's powder, to wit. To reduce local inflammatory symptoms, even before any membrane is manifested, the salicylate of soda, combined with chlorate of sodium and decoction of cinchona (Form. 97) is very useful; when membrane is seen, and is recognised as diphtherial in character, iron should be given in full doses (combined with chlorate of sodium or potassium), for this drug has proved to be, from general experience during the last forty years, the sheet-anchor of the constitutional treatment of diphtheria.

In cases of cardiac depression, strychnia should be added to the iron mixture, or it may be given hypodermically. To produce the best results the drug must be given in full doses; as much as five minims of the standard solution of the British Pharmacopœia may be administered three or four times in twenty-four hours without harm even to young children.

As to **topical** remedies, the application of pure *lactic acid* of the strength adopted in the British Pharmacopœia, on a swab of cotton wool, once or twice a day with sufficient force to detach the membrane at its edges, or even to remove it, has proved so satisfactory in my own practice, that I now rarely resort to any other measure. A diluted—1 to 2 or 1 to 4—solution of the same remedy (Form. 55) may be employed twice or thrice daily by the nurse in the intervals of the doctor's visits. The local and constitutional effects of *calomel*, by insufflation or internally administered, are much lauded by many, especially in the United States, but of its value I have had little experience. *Sulphur* and the *sulphites* have given good results, from the twofold reason that they act both systemically and locally, but they would appear to be more useful in cases of coccal infection than in those of truly diphtherial origin. *Peroxide of hydrogen* as a local application should not be neglected, for its value has been proved by trustworthy experience of many American colleagues. Theoretically

it is an almost ideal germicide, but it is both unstable in composition and variable in its results.

As a local germicide after the detachment of the membrane, the *biniodide of mercury* is to be preferred to the *bichloride*, for it is much less liable to coagulate the albumen in the secretions of the mucous membrane or of the blood. It must, however, be used with caution, and only in a strength of 1 in 2000 to 5000, for, as Roux has said, 'there is already sufficient poison in the system of a patient suffering from diphtheria to justify us in hesitating to employ remedies which are in themselves capable of producing systemic effects of a toxic nature.' This is also an objection to the use of mercury as an internal remedy, for its effects are, in what may be termed reasonable or justifiable doses, too slow to be depended on for the arrest of so acute and rapidly fatal a disease.

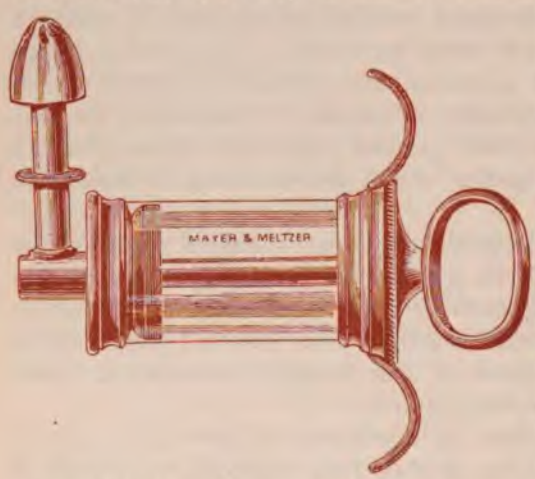


FIG. CCXXXI.—ANTERIOR NASAL SYRINGE FOR DIPHTHERIA.

Among other germicides of a less active and irritating character we may mention *carbolic acid*, *boric acid*, and *chinosol*, the last of the strength of two to five per cent. Irrigation of the mouth, by means of a specially constructed syringe, such as is illustrated in Fig. XCI. on p. 143, is in every case to be preferred to the old-fashioned and useless practice of gargling; for the latter method, while it cannot be used by children, and is seldom efficiently carried out by adults, not only necessitates the patient's rising from the recumbent position so essential to be maintained in diphtheria, but locally it throws the muscles of the throat into irregular action, and thereby favours palatal and faucial paralyses.

Löffler has made investigations on the power of certain substances to quickly destroy the bacillus of diphtheria, and has found that the salts of iron are particularly active, especially when combined with certain essences, notably benzol, toluol, creolin, and metacresol. This solution, which is now known as

'Löffler's' (Form. 63), has been tried in my practice with uniformly good results, which have, however, been more evident in cases of pseudo-diphtheria than in the true bacillary disease.

When the nares are the seat of membrane, every effort should be made to keep the nasal choanæ patent. Membrane must be removed by forceps, or by a cotton-wool swab passed along the inferior meatus. The nares should be freely irrigated with some antiseptic and germicidal solution by a special syringe (Fig. CCXXXI., followed by use of an oily spray of menthol or thymol, and supplemented in certain cases by that of an antiseptic ointment.

Externally, *hot applications* to the throat in the way of poultices are cumbersome, wearisome, and, in my experience, unproductive of sufficient relief to compensate for their inconvenience. In my paper at the Congress in 1881, I made tentative recommendations of *Leiter's coils* for application of **continuous cold** in place of ice-bags; and since that time I have had oft-repeated testimony, in my own practice and that of friends and colleagues, of their great value in diphtheria as a means of applying constant cold without moisture. The effect is to reduce external glandular inflammation, and to favour rapid necrosis and separation of the exudation. In my experience these results are thus obtained more successfully without the depression of the steam inhalations of Oertel. There is, however, nothing to prevent the concurrent adoption of both these measures.

Dietetic treatment is placed next in order for consideration, because by means of food, medication, both internal and topical, can be largely supplemented. A diabetic diet is theoretically indicated in all microbic diseases. There cannot be a doubt, I suppose, in the minds of anyone as to the value of *ice* taken by the mouth as a grateful, refreshing, and efficient means of reducing hyperæmia, and of aiding to dissolution of the exudation. Seeing the difficulty of making children take ice, I am in the habit of giving them it in the form of frozen milk sweetened with saccharin, or sugar of milk, or of frozen beef-tea. I recommend the same in the case of adult patients, and advise them to take but little other nourishment by the mouth except the raw egg swallowed whole, such as I have indicated for other diseases in which the function of deglutition, being painful and difficult, requires to be rested, or performed with the least possible effort. Regarding this question of functional rest, wherever there is a likelihood of the case becoming a severe one, and especially if food offered by the mouth becomes distasteful, regular administration of

nutrient enemata, at an early period of the disease, should be adopted.

A measure, which has a topical as well as a general effect, is the free administratiom of barley-water flavoured with lemon, or even better still is fresh lemonade, either of them being largely impregnated with chlorate of sodium. Fontaine, acting on the principle that germs cannot exist in acid secretions, makes a strong point of ordering gargles and drinks of citric acid.

Frequently, excepting a calomel purge or the administration of a small amount of compound antimonial powder at the commencement, no other medicine in the early stages need be given. Milk may be given almost *ad libitum*, to be diluted, if necessary, with lime or soda water, or with hyper-oxygenated effervescing water. I have not found milk to disagree with diphtherial patients, as is by some believed to be the case. Alcohol is to be administered systematically so soon as the strength shows the least sign of flagging, and subcutaneous injection of ether may avert or counteract cardiac inadequacy.

The following somewhat recent observations are worthy of record, as illustrating many of the points which I have insisted on in this chapter:—

CASE XCI.—C. B., æt. 3, a son of a well-to-do tradesman, had his tonsils removed with the guillotine on September 11th, 1889, in a special hospital; the child, after operation, was taken home by his mother to her residence in the Edgware Road. A week after operation he was brought back to the hospital in a condition of *malaise*, with deposit of what was thought to be the usual whitish slough on the site of the operation wounds; as this was already partly detached, it was removed by the surgeon; but no fear appears to have been entertained of any gravity in the case. Within a week (thirteen days after operation) this child died at home, and the family doctor, under whose charge he was, certified that the cause of death was croup.

CASE XCII.—Two days later, September 27th, L. B., æt. 8, an elder brother of the deceased, complained of sore throat, and was brought to me by the mother. I found a well-marked patch of diphtheria on the left tonsil. On inquiry, it appeared that the shop occupied by this family was in a most insanitary condition. Two other children were suffering from enlarged tonsils and adenoid growths, and a number of workpeople and servants in the house had complained of sore throats for some considerable period. It became evident that the first child, after tonsillotomy, had returned to an insanitary environment, and in those circumstances had readily contracted diphtheria, which had proved fatal in his case and had subsequently infected his brother, the present patient.

The treatment successfully adopted in the case of L. B. was on the lines laid down in the preceding pages. I at once removed every portion of patch on the left tonsil, and rubbed a 60 per cent. solution of lactic acid into the exposed raw surface, having previously satisfied myself that there was none present elsewhere. As both tonsils were very much enlarged, and together with the soft palate and glands at the angle of the jaw much inflamed, I ordered a Leiter's continuous cold coil to be applied outside the neck to the neighbourhood of the tonsils and larynx. The nasal choanæ, which were markedly obstructed, were well washed out with a detergent collunarium, and the erectile swelling

of the turbinals reduced by a menthol paint every three hours. The proper air-way, although very stenotic before the illness, was by these means kept fairly patent during the attack. The case was closely watched, and any sign of pellicular re-formation was at once removed by means of a sponge probang soaked in lactic acid. No re-deposit took place after the third day, but the lactic acid swabbing and the menthol applications to the nostrils were continued for a week. During this period biniodide of mercury with bark was administered internally.

The temperature, which stood at 101° at the first, was never above 99° during the application of Leiter's cold coil. The urine contained a little albumen for seven days, but this disappeared on the eighth day, *i.e.* one day after administration of iodide of iron, which had been substituted. The cardiac symptoms, apart from a rapid pulse of 120, were not serious when the patient was awake, but Cheyne-Stokes—or rather Biot—respiration, as explained on page 418, was observed on the third, fourth, and fifth nights when the child was asleep. This symptom only occurred apparently when the nasal cavities became much blocked, and did not recur when the choanæ were assiduously kept clear by the nurse with menthol paint, applied every two or three hours during the night. As regards diet, the only point that calls for mention was the fact that, on the ground that sugar favours the growth and multiplication of micro-organisms, saccharin was employed for sweetening the food. This child made a most favourable recovery, and developed no symptoms of paralysis. At a later date I removed the faucial and pharyngeal tonsils from this child, and he has since enjoyed good health.

Operative measures are generally supposed to be comprised in the one procedure of *tracheotomy*; but it is now twenty years since I first proposed and adopted the *removal of enlarged tonsils* and *œdematous uvulæ* during the *acute stage* of diphtheria. All who have any experience of the disease must be aware not only how prone are the subjects of enlarged tonsils to succumb to diphtherial influences, but also to what a serious extent the existence of such a condition complicates matters, and imperils the chances of recovery. One must have seen over and over again oral and nasal respiration each hour more impeded from this cause, and for the same reason inspection of the larynx made impossible. I therefore, in 1878, removed the tonsils of a child suffering from diphtheria on the first occasion of my seeing her. The result was an immediate improvement in her breathing; there was no extension of the disease to the larynx; the membrane was of course re-deposited on the cut surfaces, but it ultimately cleared; the child had several sequelæ of diphtheria, but finally made a very good recovery. I reported the case in detail, and exhibited the patient at the Medical Society of London. Since that time I have had similar cases with an equally good result, and also others in which I have removed from adults swollen and œdematous uvulæ during an acute stage of diphtheria. I was quite prepared to hear the wisdom of this practice questioned; but however startling the procedure may at first sight appear, any objections which could be raised against it are theoretical rather than practical, and of no account in the balance, when weighed

against its advantages—first, as removing an impediment to the respiration; secondly, as tending to prevent the downward progress of the exudation; and thirdly, as an early substitute, or means of averting the necessity for, the more dangerous measure of opening the windpipe. I was not aware until later, that Bouchut, who has the merit of first attempting intubation, had also adopted this procedure, which was, however, energetically condemned by Sanné. The treatment has since been adopted by Lefferts, who prefers in such instances to substitute the lesser danger of re-deposit for the greater one of the dyspnœa. Macintyre of Glasgow, and one of his pupils, Watson of the same city, have also advocated it. The last-named urges as advantages of the operation—(1) that the disease is often limited; (2) that germicides can be more directly applied; and (3) that the local depletion by bleeding is beneficial. The objections which have been raised are that the membrane will re-form on the cut surface, which will constitute a particularly fertile soil for the growth of the bacilli, and that the lymphatics laid open by the operation will allow a greater amount of absorption of the bacillary toxines than before; but neither of these objections seems to have been sustained by experience. On the contrary, by the test of the thermometer, pulse rate, albuminuria, frequency and severity of paralytic sequelæ, etc., evidence is all in favour of the procedure. These remarks refer to faucial diphtheria. The same experience holds good in respect to the removal of *adenoids* causing great naso-pharyngeal obstruction and reflex-spasm, as indicated in Case XCII. Further operations are necessary for relief of laryngo-tracheal extension, and this demands separate consideration.

Laryngo-Tracheal Diphtheria or True Croup.

Hitherto the word Croup has been generally employed in this country as representing a pseudo-membranous inflammation of the larynx and trachea, which, believed to be of a non-infectious and non-contagious nature, exhibits local rather than constitutional symptoms, and it was so considered in previous editions of this book. But the term has now so long been used by Continental observers whenever an exudation extends from the fauces to the larynx and trachea, that to avoid further confusion, English authors would do well to accept this position.

Croup may thus be defined as a pseudo-membranous exudation of the larynx and trachea, which may be classified

on exactly the same lines as Diphtheria in the fauces; we may thus have:—

(1) Pure, simple, or bacillary Croup.
(2) Impure, complex, or cocco-bacillary Croup.
(3) Pseudo, false, or non-bacillary Croup.

Croup is rarely primary in the larynx, being usually exhibited as a downward extension of the membrane from the fauces, when it is called *descending*.

Cases without doubt occur in which there is apparently no evidence of direct extension of the membrane from the fauces, but experience leads to the belief that it is the rule whenever the larynx is involved. In most cases the exudation will be seen to have commenced by creeping along the outskirts of the larynx from the lateral glosso-epiglottic folds. The epiglottis is almost invariably first attacked, and seldom escapes.

FIG. CCXXXII.—NON-BACILLARY CROUPOUS MEMBRANE FROM THE TRACHEA. STAPHYLOCOCCI with a few STREPTOCOCCI *in situ*.

An *ascending* form of croup, otherwise an upward extension of membrane from the bronchi to the larynx, has also been described, but it is difficult of proof. In any case it must be rare.

When non-bacillary, **Croup** has been asserted by Dieulafoy to be due to the presence of little cocci, which present themselves in groups of two, and by Klein and Councilmann to streptococci; but why pseudo-diphtherial croup should be attributed only to one or other particular micro-organism, it is somewhat difficult to understand, since there is no evidence that the cocci which characterise a faucial inflammation change their character as the disease descends to the larynx.

Fig. CCXXXII. represents a case in which false membrane in the trachea was due mainly to staphylococcal infection, and the following is an example illustrative of pseudo-diphtherial croup, of strepto-staphylococcal origin:—

CASE XCIII.—F. H., male, æt. 3. Admitted to hospital February 17th, 1895, at 7 P.M., having suffered from cough and sore throat since 14th. No fact could be elicited pointing to the possibility of a scarlet fever infection. Albumen was present, but at no time was more than a haze.

On admission, membrane was seen on both the tonsils and soft palate. Croupy cough and marked ensiform retraction suggested laryngoscopic examination, when membrane was seen in the larynx. 20 c.c. antitoxin (B. I. P. M.) injected.

Bacteriological examination, from cultures made on admission, showed strepto- and staphylo-cocci, but no diphtheria bacilli. This examination being doubted, another was made on the 21st, but likewise failed to reveal diphtheria bacilli.

March 3rd.—A rash was noted, which disappeared within twenty-four hours.

Death took place on March 13th. *Necropsy* revealed the following:—Lower lobes of lungs airless, especially on the right side; evidences of broncho-pneumonia in the middle lobes. A soft membranous exudation, extending from the lower surface of the epiglottis along the larynx and trachea, so as to make an almost complete pulpy cast of this tract. Similar membrane was seen to extend into the left bronchus.

Equally at fault are those who lay it down that no disease but Klebs-Löffler diphtheria can produce a false membrane in the larynx, for Billings (1894) has found that of 286 cases in which the membrane was confined to the larynx and bronchi, 80 per cent. proved to be true diphtheria, as judged by the presence of the specific bacillus, while 14 per cent. were undoubtedly not diphtheria, on application of the same bacteriological test. This last view is in entire agreement with my own conclusions, not only as to fact, but to frequency.

These opinions and statements refer especially to those cases in which croup is due to micro-organisms; but false membranes of essentially the same macroscopic and microscopic character (minus the bacillus) as those of truly diphtherial origin have been reported as produced on the mucous lining of the buccal cavity and air-passages by every kind of traumatism; for example, irritant poisons, solid, fluid, or gaseous, scalding water, scorching heat, chemical or galvano-caustics, or even strong Eau-de-Cologne. Oertel performed the experiment of dropping a few minims of liquor ammoniæ into the trachea of seventeen animals, and succeeded, in every instance, in generating an artificial croup.

There are still many practitioners, whose opinions are entitled to respect, who hold that croup may be the result of exposure to atmospheric causes, such as intense cold, and quite independently of any microbic infection; but in the light of advanced bacteriology many traumatic and all atmospheric causes must, in the future, be held to be only predisposing.

SYMPTOMS.—The onset of primary croup may be heralded by those general prodromata common to diphtheria of the fauces, but more usually croup occurs as an extension from the fauces, to be witnessed on the third or fourth day. The difference in

situation results in functional disturbance, which, according to Barthez, may be divided into three successive stages, the first characterised by cough and hoarseness, the second by aphonia and paroxysmal dyspnœa, and the third by suffocation and asphyxia, ending in death. Between all these there is no hard and fast line, and indeed very many cases never go beyond the first stage, in which circumstance Ruault employs the term *abortive croup*.

Croup begins with a small, dry, and frequent **cough**, which, commencing with a high-pitched, metallic, and ringing sound, generally denominated brassy and laryngeal, is liable to become gradually muffled and even noiseless.

Change in the **voice** is another and sometimes the first symptom. Beginning as a simple catarrhal hoarseness, it is soon observed to assume a metallic timbre and to be raised in pitch. When membrane is abundantly manifested on the cords, complete aphonia may ensue. This phenomenon may also be explained by paralysis of the adductors. This may be merely functional, or due to diphtherial neuritis and myopathic changes. Sometimes there is slight **pain** in the region of the larynx.

Embarrassment of respiration quickly supervenes, the movements increasing in rapidity to thirty-five or even forty per minute. There now occur attacks of paroxysmal **dyspnœa** of the most painful and alarming character, and these may commence so soon as a few hours after the first warning that there is anything wrong. Each inspiration is attended by a peculiar stridor, which constitutes one of the most marked characteristics of the disease. This stridor has been variously described as high-pitched, piping, shrill, metallic, sibilant, and wheezing. During the dyspnœa there is indrawing of all the muscles of the supra- and sub-sternal regions, as also of the epigastrium, the false ribs, and even the lower portion of the sternum itself; of all those parts, in fact, which would generally be distended in healthy inspiration. All the inspiratory muscles, regular as well as auxiliary, are observed during the spasm to work painfully; the dilated nostrils, the terrorised expression of the face, and convulsive movements of the limbs, all giving evidence of a laborious and futile struggle for breath. The complexion becomes cyanotic, and death from apnœa appears imminent and may even occur. Should membrane be coughed up there may be a favourable termination to the dyspnœa, when the metallic sound of the cough will be observed to change to that of a bronchitis or remitting laryngitis.

DIAGNOSIS.—Independently of the question of membrane in

the fauces, the history of the attack, the absence of fever and cough, and the complete remission of all symptoms between the attacks which distinguish laryngismus stridulus, and the reflex cough observed in some cases of enlarged pharyngeal and faucial tonsils, are sufficient to prevent the graver malady being mistaken for the milder.

LARYNGOSCOPIC SIGNS.—In a case of average acute type, the larynx presents, at the onset, a diffuse red colour of varying intensity, and with some tumefaction of the mucous membrane. Later, there are seen here and there on the epiglottis, the ary-epiglottic folds, the inter-arytenoid commissure, ventricular bands, fine pellicles of membrane, which is at first of a brilliantly opalescent white (Fig. 56, PLATE VII.). These become yellow or greenish in colour, and thick and opaque, with a tendency to spread over the greater part of the laryngeal vestibule, and finally to reach the vocal cords and the sub-glottic region. In other cases the larynx may be seen to be simply red, and to exhibit only a minute quantity of membrane, whilst the sub-glottic region and the trachea, so far as can be seen, are more or less entirely covered by fibrinous exudation. Failure to discover membrane in the larynx by no means implies that there is no exudation in the infra-glottic region. Often in examining a faucial diphtheria the membrane may be seen extending to the free edge of the epiglottis and no further; but these cases, as a rule, give no trouble from laryngeal symptoms. In others, considered to have arisen primarily as laryngeal, membrane may have cleared away from the fauces before the air-passages have been attacked.

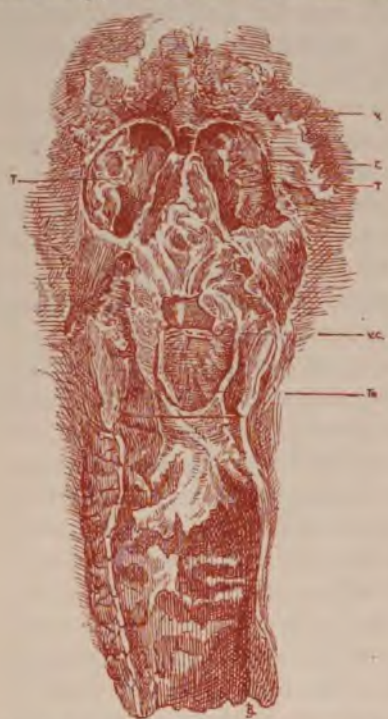


FIG. CCXXXIII.—DIPHTHERIA OF NARES, FAUCES, LARYNX, AND TRACHEA.

No doubt both the extent and density of the membrane play very important parts in the obstruction, but a very small and thin pellicle of exudate is compatible with much dyspnœa and spasm.

Actual nervo-muscular laryngeal paralysis is an exceptional, and cannot be considered the usual, cause of dyspnœa, but when it does occur it probably involves the *abductors* rather than the *adductors*, because loss of phonetic quality is by no means uniformly synchronous with extreme dyspnœa, unless the vocal cords are themselves the site of membrane. The nasal voice, due to palatal paresis, is to be distinguished from changes in primary laryngeal tone. Not that we deny that the adductors are also and, indeed, mainly implicated, and this is often the cause of the aphonia, but in such case the respiratory difficulty is more likely to be due to spasm, and is consequently of a less dangerous character. Even when the dyspnœa appears to be entirely due to a mechanical obstruction of the air-passages by membrane, spasm is always superadded. Administration of chloroform during an attack of dyspnœa bears out this idea, as under its influence the dyspnœa diminishes or even disappears altogether.

FIG. CCXXXIV.—TRACHEAL AND BRONCHIAL CASTS, from a Case of Diphtherial Croup.

Of **complications** due to croup, *acute bronchitis* is very common.

Pseudo-membranous bronchitis is rare, or perhaps one might say difficult of recognition, during life, since stethoscopic signs are uncertain; the only sure sign of membranous extension to the bronchi is the expectoration of ramified casts of the tubes (Fig. CCXXXIV.); but, as previously stated, diphtherial exudation diminishes in fibrinous quality the lower it descends, and is often found to be of almost fluid consistence in the smaller bronchi.

Broncho-pneumonia is to be recognised by well-known signs, and may generally be interpreted as evidence that the croup is either pseudo or complexly diphtherial in character.

PROGNOSIS, COURSE, AND TERMINATION.—Even mild attacks of croup should give cause for anxiety, for neglect of a simple case has frequently been followed by relapse of the malady in an

aggravated form, with a suddenly fatal termination. Age is an important element in prognosis, and the older the child the more favourable is the chance of recovery.

The general elements of prognosis in faucial diphtheria apply equally to the laryngo-tracheal form, in which, however, there is an added danger of no little importance, viz. laryngeal obstruction. When croup does not extend beyond the vestibule, it may remain latent, and recovery take place without having given rise to any symptom of distress; and even when it has advanced so far as the inter-arytenoid space, spontaneous cure is still possible, and such recoveries occur to the probable extent of 5 to 10 per cent. When the membrane extends further, and there is paroxysmal dyspnœa and aphonia, spontaneous cure rarely, if ever, takes place. But surgical intervention distinctly diminishes the mortality.

In the course of the disease towards restoration to health, gradual separation of the membrane takes place, followed by free mucous expectoration, and diminution in the severity and stridulous character of the cough and respiration.

In milder cases there may be no objective evidence at all of membrane in the expectoration, the exudation having either not arrived at the stage of fibrinous deposit, or having become pultaceous before release.

The duration of a case in its acute form is from four to ten days; complete recovery being delayed to a month or five weeks, and in some instances being followed by one or more relapses.

When the disease takes an unfavourable course, the paroxysms become more frequent and almost unremitting; the cough, although toneless, is more distressful; the pulse-beats are more rapid, the little patient is more restless, and the extremities become cold; finally they, as well as the countenance, become cyanotic.

The fatal issue may occur in any of the following ways: by *apnœa*, or by *convulsions* during a paroxysm of dyspnœa; by *asphyxia* through actual blocking of the air-passages with membrane; by *cardiac failure*, due to diphtherial toxæmia or to deposit of *fibrin* in the *heart* and great blood-vessels; by *exhaustion and coma*; and finally, by *secondary lung complications*. The date of a fatal termination is seldom extended beyond the fourth or fifth day, unless tracheotomy has been performed, in which case, even if life be not saved, death may be somewhat delayed, and is more peaceful.

TREATMENT of Croup requires to be pursued with energy and discretion from the first.

There is a general consensus of opinion in favour of an atmosphere hyper-saturated with steam; but this treatment is often carried to excess.

The bed should be curtained, and vapour brought near it by means of a steam-kettle, but the croup tent bed, which gives the little patient a continuous vapour-bath, is as unnecessary as it is depressing. If vapour is required to be brought nearer to the child's mouth, that purpose is best effected by a steam draught inhaler with plain water impregnated with pine oil (Form. 37), or in the case of spasm with benzoin and chloroform (Form. 28).

This desideratum may be enhanced by the general inhaling of carbolic acid vapour from a steam-kettle placed near the bed, so that the patient may be said to live in such an atmosphere night and day. But as children are very liable to carbolic acid poisoning, the effects on the urine should be carefully watched, or pinol, eucalyptol, or terebene (Form. 34, 36, 37) be substituted. This measure, combined with internal administration of sedatives to allay spasm, is in many mild cases all that is required.

In infants it may be impossible to apply local remedies to the membrane, except by a cotton-wool laryngeal brush introduced by guess work; but in those older, by help of the laryngoscopic mirror, and after the use of cocaine or eucaine spray to allay spasm, one may sometimes be able to detach it and apply strong antiseptic solutions.

Of **general** measures of traditional repute there is much to be said in favour of an emetic given at the first onset of an attack, and it is indicated on the ground that, should membrane be formed in the trachea or bronchi, as is not unfrequently the case, before the manifestation of laryngeal symptoms, an emetic may possibly favour its expectoration; and even later, when the larynx is covered with membrane, the action of an emetic may help to detach pieces of it which are only slightly adherent.

An emetic is contra-indicated where the diphtherial asthenia is at all pronounced; in any case, it should only be employed in the early stages of the attack. The best form of such a remedy for a child from one to five years of age is a teaspoonful of ipecacuanha wine every fifteen minutes till vomiting is produced.

The further general and constitutional treatment of croup is to be carried out on exactly the same lines as in faucial diphtheria.

When *asphyxia* is threatened by the mechanical obstruction

of the membrane in the larynx, further operative procedures are necessary.

Which is it to be, Intubation or Tracheotomy? To decide this, the first step is to make, if possible, a laryngoscopic examination, which alone can give us an adequate idea of the extent of surface involved ; and if the laryngeal mirror, as has been all along contended, is advisable in case of diagnosis, it is indispensable when deciding on an operation, and it is not unnecessary to repeat that only those in the habit of using it are in a position to appreciate how much aid it can afford.

Success in the treatment of diphtherial croup is not to be estimated by published lists of tracheotomies or intubations, but rather on the number of favourable results which are obtained without operation; and the more expert the practitioner is in the use of the laryngoscope, and the more skilled in making intra-laryngeal applications, the smaller will be the number of occasions on which he will require to resort to operative procedures.

Examination with the laryngoscope may reveal the presence of only a small piece of membrane removable by the laryngeal cotton-wool brush, the hand being guided by the mirror. No operation whatever may be required should the foregoing procedure be happily effected.

On the other hand, there may be noticed a redness of the vocal cords without much membrane in the glottis, in which case intubation would relieve the associated spasm ; or such an amount of membrane may be seen on the cords and below them as to contra-indicate intubation and to demand immediate tracheotomy.

Other data have to be considered before we can decide whether to intubate or to open the windpipe.

From the standpoint of statistics one cannot give preference to one or the other, except that in children under four years intubation is probably a more successful operation. The question is, which is the more simple and more easily executed, and what are the relative advantages and inconveniences?

Even in experienced hands, difficulties often occur in the introduction of the intubation tube which may equal those of tracheotomy. Not infrequently it has been found necessary to perform tracheotomy after intubation, because the latter may fail to afford relief to the embarrassed respiration, or it may be found impossible to nourish the child properly ; and the operator should be forearmed against this eventuality, having ready the necessary instruments for an immediate tracheotomy in case the intubation tube cannot be introduced, or lest, in the very act of introducing

the intubation tube, membrane has been pushed down so as to block the respiratory tract. And the same precaution should be observed when proceeding to withdraw an intubation tube from the larynx, often an even more difficult operation than the introduction, so that it would be well that the instruments for the two operations were always carried in the same case.

A point not in favour of intubation is the fact that the removal and re-introduction of the tube requires skilled hands, whereas the nurse may remove, cleanse, and replace the tracheotomy tube.

In hospital practice, where everything is ready and skilled assistance at command, there is more to be said in favour of intubation than there is in private practice, in which these difficulties rather prevent intubation from becoming a formidable rival to tracheotomy.

After intubation there is usually, as already premised, trouble in deglutition, but this difficulty may be overcome by giving food of a semi-solid consistence and in a particular manner to be presently described.

False membrane and mucus from the trachea is expelled less easily in intubated cases, and the tube is liable to blocking by exudation drawn upwards into it on coughing; but this latter accident is quite as probable in the case of tracheotomy. It is, however, more easily overcome by the simple removal and cleansing of the inner tube, which can be done by the nurse, at the same time clearing the trachea by long forceps or feather. In the case of intubation, removal and re-introduction of the intubator when necessary may be unduly delayed, since being more intricate it requires technical skill not always at hand.

The operation of tracheotomy gives functional rest to the larynx, and permits a more thorough clearing away of membrane and more efficient medication of the regions both above and below the tracheal opening. And not the least valuable point in favour of tracheotomy is the access which it gives for the application of solvents such as lactic acid, disinfectants such as biniodide of mercury, or liquefiers of mucus such as bicarbonate of sodium, whereas intubation is actually adverse to employment of these valuable auxiliaries.

In view of the tendency of the diphtherial poison to attack peripheral nerve tissue, especially of those muscles which are most in use, and in the order of vital importance, it is probable that the occasional ulcer caused by pressure of the intubator is a direct result of atony of the laryngeal muscles.

In very young children, under four years of age, intubation has given better results than tracheotomy. Stern's statistics show that under three and a half years, intubation gives a decidedly larger number of recoveries. Being a bloodless operation, and not requiring an anæsthetic, the consent of parents is more easily obtained, and thus children are saved who would otherwise die owing to inability to obtain the parents' consent for tracheotomy. For a similar reason the operation can be performed earlier, before the patient is moribund—as too often happens with tracheotomy.

Tracheotomy is a procedure which is each year viewed more favourably, mainly because the indications for its performance are becoming better appreciated, and we are now able to assure the relatives of a patient that, when adopted sufficiently early, the chances of success are much greater than formerly.

The indication for operative interference, whether tracheotomy or intubation, is the occurrence of *progressive asphyxia*, as evidenced by the suppression of voice, increasing dyspnœa, stridor, cyanosis, and especially by the retrocession of the chest walls. When on auscultation the vesicular murmur is not clearly heard, but in its place the inspiratory laryngeal sound, there should be no delay in operating, though an attempt should always be made to verify the cause of the symptoms by the physical signs as capable of detection with the laryngoscope. There are, indeed, no contra-indications for tracheotomy once its necessity is indicated, and the sooner it is done before exhaustion sets in and the system is loaded with toxines the greater the chance of success. The younger the child the less should be the delay. Another reason for early operation in laryngo-tracheal diphtheria is its well-known tendency to spread downwards, and thus set up a serious membranous bronchitis.

As to the risk of pulmonary complications, and, in particular, broncho-pneumonia, to which a useless tracheotomy would expose the patient, we are not justified in making that an argument for delaying tracheotomy to the last moment.

Early tracheotomy is, then, more advantageous than late tracheotomy. In other words, one need not wait till there are pronounced signs of asphyxia, but, on the contrary, should act as soon as there is slight suffocation and dyspnœa. Another advantage of this practice is to spare the patient not only hours of anguish, but much emotion and pain. Besides, the early operation not being suddenly called for is carried out under anæsthesia, is done without hurry, and in every respect under the best possible conditions.

If even before occurrences of respiratory signals of distress membrane can actually be seen in the larynx by means of the mirror, no delay should be allowed to occur, and the advisability of opening the windpipe should be promptly urged. Its performance is not advocated where the chances are, from excessive toxæmia or septicæmia, hopelessly unfavourable, because knowledge of fatal results tends to influence parents in their refusal under circumstances which are perhaps most favourable. Nevertheless, it is noted that in many cases in which death occurs after tracheotomy, the operation gives some days or hours of quietude, and the end is much more tranquil than would otherwise have been the case. The operation is here considered principally with regard to children, in whom death by mechanical obstruction is much more frequent than in adults, in whom, indeed, not only is tracheotomy far less frequently called for, but it would appear is less successful than in children, probably because the dyspnœa when present is not so purely mechanical in its nature.

Details as to the performance of tracheotomy are to be found in all surgical text-books. The operation itself, though an easy one in the adult and in chronic disease of the larynx, is, on the other hand, full of difficulty in so acute a disease as diphtheria, and in the very young, on account not only of the spasm, but of the depth at which the trachea lies in the case of a fat child, the shortness of the neck, the relatively large size of the thyroid isthmus, and, up to the age of about fifteen months, the possible presence of the thymus gland.

It is further to be noted that it is well to make the operation as far as possible a bloodless one by discarding the knife after the skin incision is made, and separating the soft parts by means of dissecting forceps.

The trachea should not be opened until its rings are clearly exposed and made free of all superposed tissue. I am in favour of a moderately high tracheotomy, and always endeavour to cut below the first and, if possible, the second tracheal ring.

A point by no means unimportant is to make a sufficiently long skin incision, and it may be added that all blood vessels should be doubly secured by forceps before dividing them. Some surgeons take no great precautions on this point, but put in the cannula before bleeding has stopped, in the belief that once the tube is introduced hæmorrhage will be arrested. That way danger lies.

Anæsthesia by Chloroform is both permissible and advantageous; it is preferable to ether, which is, indeed, contra-indicated

from its liability to induce rather than to allay spasm of the glottis.

The operation over and respiration re-established, a successful result largely depends on vigilant nursing of the patient, careful cleansing of the tube and dressing of the wound, together with the observance of strict hygienic precautions. The temperature of the room should be kept constant, and the carbolic or other vapour kept playing continually to moisten and sterilise the atmosphere. Caution, however, must again be given against this treatment being so overdone as to lead to even greater depression and to increased liability to pneumonia.

The after-treatment consists in covering the wound under the tube with an antiseptic dressing, such as blue gauze, and the same to be lightly laid over the orifice. At our hospital we are also in the habit, *after all tracheotomies*, of having a woollen pad with antiseptic gauze-covering laid over the chest to preserve from damp and cold arising from sprays, steam inhalations, etc. Bin-iodide of mercury (1 in 4000) is sprayed over and around the wound every two hours. After tracheotomy in favourable cases there is high temperature for forty-eight or seventy-two hours. Should the tracheal mucus be scanty and tenacious and difficult to expel, an antiseptic alkaline lotion may, in the alternate hours, be applied by the atomiser through the cannula, thus favouring a moist condition of mucus—not of membrane—and making expectoration more easy. Cough aids the expulsion of mucus and membrane, and, indeed, it is often of great utility to tickle the trachea by means of a feather charged with dilute lactic acid, thus simultaneously exciting cough and softening and removing membrane. The inner tube should be removed every one or two hours, cleansed, disinfected, and re-introduced.

The tracheal opening is to be regarded not only as affording relief to an obstruction in the natural breathway, but also, and most importantly, as a preliminary to adoption of measures for clearing the air-passages of such membranous obstruction, and the practitioner must not neglect continuance of persevering efforts in that direction, and in such local medication as may prevent exudative re-formations; but failure to always effect this end, as proved by the presence of membrane in the trachea in a fatal case of membranous laryngitis after tracheotomy, must not be regarded as any evidence of the want of due care on the part of the surgeon in charge, as has been suggested by an author on this subject.

With regard to removal of the membrane through the tracheal

opening, attempts to this end by oral suction either of doctor or parent ought not to be necessary in these advanced days of mechanical aids. One very simple instrument for the purpose is that of a Siegel's exhausting syringe, such as is employed in aural practice, with a strong exhausting soft rubber bag to effect suction, the 'aural' end being adapted to the mouth of the tracheotomy tube by means of the aspirator known as Coudereau's. By this instrument, made for me by Messrs. Krohne and Sesemann, not only can exudates be extracted, but by a very simple contrivance, familiar to all who use aspirators, fresh air or hyper-oxygenated air can be introduced into the lungs almost instantaneously after the extraction.

One other hint hardly necessary to experts. In removing membrane through a tracheal cannula, it is better to clear it by the inner tube, so that, in case that passage is blocked, freedom can be given to respiration through the outer cannula. A double cannula, always of value in tracheotomy, is of indispensable importance in cases of diphtheria.

At the end of twenty-four hours, the cannula should be removed and replaced by another of the same size and shape, and this procedure should be repeated at least once a day until the tube is finally removed. Before this last step is taken, the tubes should be removed for a gradually increasing period of from four to eight hours. The withdrawal of the cannula often occasions expulsion of much membrane and mucus.

Constitutional treatment in the shape of analeptics should be continued, and the indications for alcohol should be diligently observed. The child should not be overfed, a small quantity every two or three hours is sufficiently often, and it is a point worthy of notice that soft semi-solid food is more easily swallowed than liquid. Feeding by the œsophageal tube may require to be resorted to.

The possible complications after tracheotomy are peri-tracheal cellulitis and abscess, emphysema, erysipelas, membrane on the wound, gangrene, and broncho-pneumonia.

The last is by far the most frequent cause of death after tracheotomy, a less frequent cause being cardiac failure, and still less, membranous bronchitis. The other complications are, no doubt, largely due to lack of antiseptic details. According to Cadet de Gassicourt, the cases of broncho-pneumonia which get well are those which appear from five to eight days after the operation, whereas those which follow tracheotomy in one or two days usually terminate fatally.

Intubation of the Larynx is the method of relieving laryngeal dyspnœa by introducing a tube through the mouth, and placing it in the larynx with its upper end below the epiglottis. It was first adopted by Bouchut in 1858; but the credit of re-introducing and gradually perfecting the instruments and method now in use must be assigned to the late Dr. Joseph O'Dwyer of New York, who commenced his experiments in intubation in 1880.

Some objections which render it improbable that intubation can ever entirely supersede tracheotomy have been mentioned, but without doubt there are many cases in which it may, at any rate, be adopted as a preliminary, and in not a few as a substitute. The operation has been performed extensively in America and to some extent in this country, and has been successful in very young children,—the very class, in fact, in whom tracheotomy has given the least favourable results. I had the opportunity of seeing some cases at Chicago, under the care of Dr. Waxham, in 1887; and I have since had some encouraging experiences of the operation in my own practice. Thus brought face to face with it, I am bound to confess that many of the objections which I formerly entertained have been almost entirely dissipated; and in a communication read at the meeting of the British Medical Association at Glasgow in 1888, I stated somewhat fully my mature views on the subject; these further experience has confirmed.

The vast difference in the frequency with which the operation has hitherto been performed in America and in this country is no doubt partly due to the greater prevalence of diphtheria in America. It is probable, however, that the laryngeal mirror not having been used in the majority of cases, for the purpose of forming an exact diagnosis of the condition of things, the operation may have sometimes been performed for mere spasm, and before membrane had extended to the glottis. In any case, it is unquestionable that some of those who have had the largest number of cases of intubation in America are not laryngologists nor expert with the laryngoscope. On the other hand, a large number of cases have been recorded by Roe, Ingalls, Casselbury, Stern, and Bleyer, to the nature of whose cases such an objection could not possibly be advanced.

A set of intubation instruments as now generally sold consists of five *laryngeal tubes*, together with a *gag*, an *introducer*, and an *extractor*. A scale is also supplied indicating the length of the tube suitable for a particular age. The tubes are made of brass plated with gold, and vary in length from $1\frac{3}{8}$ to $2\frac{1}{2}$ inches. The

calibre of the largest tube is about $\frac{1}{4}$ by $\frac{1}{8}$ inch, and that of the smallest about half that size. The upper end of the tube is expanded into a head, which rests on the ventricular bands and prevents the tube slipping down into the trachea. The anterior part of the head is levelled off so as not to press on the base of the epiglottis. There is a small hole near the anterior part through which a thread can be passed. In the middle of its length is a

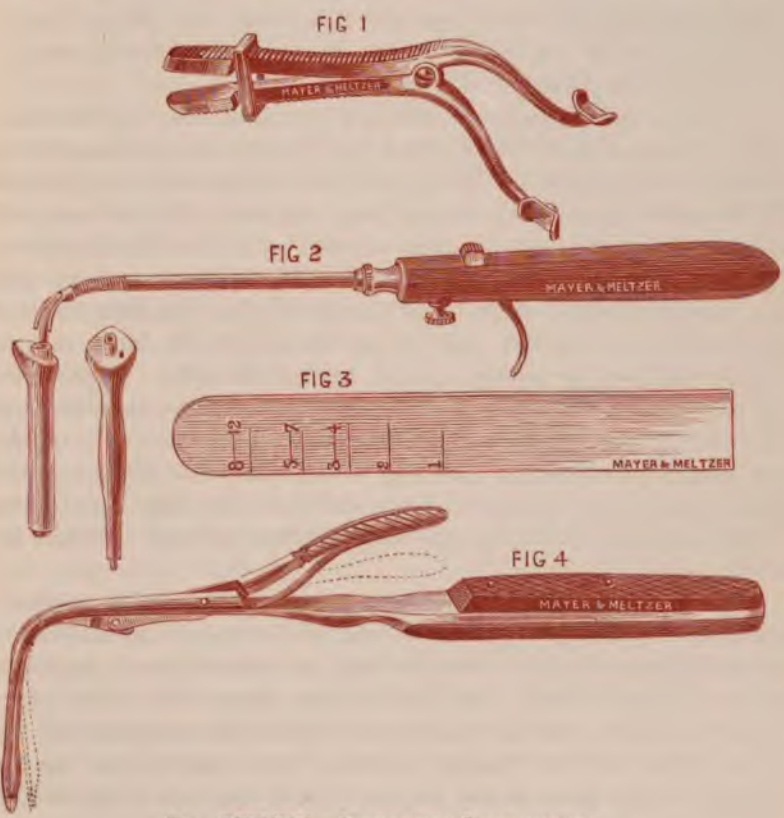


FIG. CCXXXV.—INTUBATION INSTRUMENTS.

fusiform enlargement by which the tube is retained in the larynx. Each tube is supplied with a so-called obturator, which is inserted into the tube, and fits the openings accurately at each end. In the upper end of the obturator is a small hole by which it can be screwed on to the introducer when the tube is about to be used. At the distal end the obturator projects slightly so as to form a probe-pointed extremity, which diminishes the risk of injuring the parts during introduction. The introducer consists of a handle

and a shank, bent at its distal end at a right angle. To this end the obturator is screwed on, and, by pressing a button in the upper surface of the handle, two claws may be made to project downwards on the head of the tube, so as to push it clear of the obturator, and to allow the introducer with the attached obturator to be withdrawn when the tube is in position. The extractor is a curved instrument, at the distal extremity of which two small blades can be made to dilate by pressure on a spring in the handle. The extremity is inserted into the tube with the blades closed, when pressure on the spring causes the blades to open, and the tube to be firmly held.

In *performing intubation*, the first step is to select a tube suitable to the age of the child, which may be done approximately by reference to the scale. The tube is threaded with a piece of braided silk some sixteen inches long, the ends of which are tied together. The obturator is then screwed on to the introducer, and the tube is fitted on to the obturator. The nurse, seated upright in a straight-backed chair, takes the child in her lap with its back pressed against the left side of her chest, and its head thrown slightly backwards, resting against her left shoulder. She passes her arms round the child, and crosses its forearms in front and holds the wrists tightly, and, if necessary, she secures the child's legs between her knees. The gag is next placed well back at the left corner of the mouth, and an assistant, standing behind the nurse's shoulder, holds the gag and steadies the head between his hands.

The following are the directions usually given:—The operator, standing or sitting in front of the child, takes the introducer in his right hand, and hooks the loop of thread round the little finger of the left hand. He then rapidly passes the index finger of the left hand over the tongue and behind the epiglottis till the upper orifice of the larynx is felt. With the handle of the introducer held close to the patient's chest, the tube is introduced into the mouth and passed back over the base of the tongue, guided by the index finger, and kept as nearly in the middle line as possible. When the point of the tube reaches the epiglottis, an abrupt turn is given to its course by raising the handle of the introducer, and thus bringing the tube into a vertical position. The tip is then passed into the larynx along the palmar surface of the guiding finger. As soon as the tube is in the larynx, it is detached from the guide by pressing forwards the button on the handle, and as the guide with the attached obturator are withdrawn, the tube is pressed down with the tip of the left index

finger until its flange is felt to rest on the ventricular bands, when the finger is at once withdrawn.

Fig. CCXXXVI., which is taken from Dr. Waxham's book, represents the curve that should be made by the end of the tube while it is being introduced, the dark line indicating the path it should follow. If the point of the tube be continued in the curve as indicated by the dotted line, it will invariably enter the œsophagus.

The entry of the tube into the larynx is indicated by violent coughing, quickly followed by easy breathing. The rapidity with which the bases of the lungs are aerated after the tube is in position is simply astonishing, and if there is any doubt as to the position of the tube the surgeon's ear applied to the back of the little patient will often settle it. If the instrument has passed into the œsophagus there is no violent coughing, and no relief is given to the breathing, and the loop of thread will be found gradually shortening as the tube sinks into the œsophagus. In that case the loop should be pulled upon, and the tube withdrawn. When quite satisfied that the tube is in the larynx, the operator removes the gag, and waits a few minutes to allow the cough to remove the mucus and fragments of softened membrane. It is recommended that the gag should be then replaced, and the loop cut close to the mouth, and, while the left index finger is passed down on the head of the tube to steady it, the thread should be drawn out; but in many cases it is better to leave the thread in for a short time, fastening it to one or other cheek by a small strip of plaster.

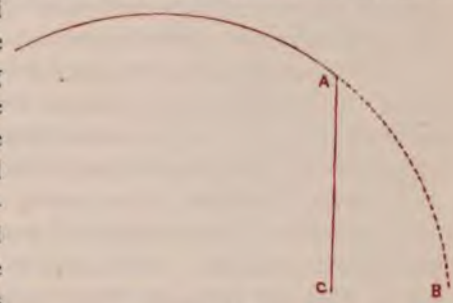


FIG. CCXXXVI.

When the tube has to be extracted, the patient is placed in the same position as for introduction. The gag is inserted, and the left index finger is passed behind the epiglottis till it feels the opening in the head of the tube. The extractor, in the right hand, is introduced, and its point guided into the opening by the finger. By pressing on the lever in the handle the blades are dilated, thus holding the tube firmly while it is withdrawn.

Intubation is an easy and safe operation in the hands of an operator possessed of moderate dexterity and a thoroughly

practical acquaintance with the parts dealt with, but to one not accustomed to put his finger in this part of the throat, the first attempt will often be attended with difficulty or failure.

As I have remarked in the paper already referred to, it is in a sense a tribute to the merit of intubation that the most successful results have hitherto been obtained by practitioners, not laryngeal specialists. With the gag in the mouth, it is perfectly possible to see the glottis with the laryngoscope, especially with the aid of Dr. Bleyer's traction-hook, which exposes the epiglottis, and it is not only more easy and rational, but obviously far more safe, to introduce the tube by means of the eye than by the sense of touch, especially as by the introduction of the hand there is great risk of increased suffocation as well as of injury to the soft parts in a condition of inflammation or ulceration. Moreover, to learn the knack of introducing an instrument by sight requires no more practice than the guiding of it by the sole aid of the finger, and the same may be said as to its extraction.

After the tube has been placed in the larynx, and after the first effects of irritation have passed off, respiration will usually be carried on easily. It has occasionally happened that during the introduction, false membranes have been detached and pushed down before the tube, thus causing suffocation. The accident is rare, and when it has happened immediate removal of the tube has almost invariably been followed by coughing up of the membrane. Should this not occur, tracheotomy should be done, and it is therefore well to have tracheotomy instruments ready at hand.

During the course of the treatment the tube is cleared of mucus by the ordinary efforts of respiration and cough. If it becomes clogged it is usually coughed up. There is, as a rule, no danger of suffocation in such cases for some hours, so that ample time is usually allowed to summon the physician or surgeon in charge. Sometimes the tube is coughed up independently of getting blocked. When the tube is very easily coughed up, it is an indication that the size used is too small.

It is usually ejected from the mouth, but it has occasionally been swallowed, and in all the recorded cases where this has happened (with one exception, when it was found *post-mortem* no further down than the stomach), it has been passed without difficulty *per rectum*. The tube must be extracted at any period of the treatment if there are symptoms of its being obstructed. Otherwise, most operators do not interfere with it. In the course of from four to six days the swelling and spasm will have so far diminished that the tube will be coughed up, and it will then

probably be found that it is no longer required. If about the sixth day it be not coughed up, it should be removed with the extractor, and need not again be introduced if the breathing is easy.

Some children after intubation swallow without difficulty both liquids and solids. In others, each attempt to swallow, more especially liquids, excites cough, owing to the entry of some portion into the air-passages. Semi-solid food is therefore preferable. It is, however, usually possible to overcome the difficulty of swallowing, even of liquids, by placing the child on its back in a horizontal position with its head hanging backwards, as described by Casselbury. In this position the child may suck from a bottle or be fed with a spoon. In some cases the child swallows as well or better lying on the abdomen with the head hanging forwards—that is, in the same position as that found to be convenient in cases of dysphagia due to tuberculous ulceration of the epiglottis.

Hygienic and prophylactic measures to be observed with regard to diphtheria differ in no respect from what would be required in the case of any other infectious or contagious disease.

They consist essentially in the embracing of every opportunity of purifying the air of the sick-room, and purging it of exhaled and volatile toxic ingredients that may be generated. This purpose is best affected by securing to the patient an atmosphere as pure as possible, and by taking every precaution against a further development of the poison as conveyed in the defecations and eliminations of the tainted individual.

First, he must be isolated as far as possible from other inmates of the house, and be placed in a large airy room, the temperature of which should be regulated according to the season of the year and the barometric condition of the atmosphere. If the case occur in the winter months, the wind being in the north or north-east, the air of the room is not only to be well warmed, but also softened by steam impregnated with some eucalyptol or other fragrant essential oil; if in foggy weather, with wind in the south-east, a drier warmth is indicated. If, on the other hand, the case occur during the summer, fresh air, with precautions against draught, may be admitted to a much freer extent, and steam may be almost dispensed with.

All excretions should be treated with strong liquid disinfectants, and the w.c. employed for their bestowal should not be used even by the immediate attendants.

Since disinfection of the atmosphere by chlorine, euchlorine, iodine, bromine, sulphurous acid, or any of the other more active

but somewhat suffocative disinfectants is not always possible in the patient's room or immediate neighbourhood, the atmosphere passing to and fro the doors and passages of the sick-room may be asepticised by sheets soaked in Burnett's fluid, Sanitas, Eucalyptus, and similar solutions. A 'Sanitas' kettle may be conveniently placed outside the room, so that when the door is opened the air comes in not only warm and moist, but impregnated with oxidising constituents. Sprays of Condy, Sanitas, etc., by means of hand-ball or steam atomisers, may also be employed.

After tracheotomy, local precautions against admitting untempered air through the tracheal tube must be rigidly pursued.

In view of the possible occurrence of syncope, the patient should be kept perfectly quiet as regards bodily movement, and should be nourished by means of 'feeders,' so as not to allow even the raising of the head from the pillow.

I have for many years insisted that all persons in immediate attendance on diphtheria patients should gargle freely with some antiseptic or detergent solution after each ministration that may have involved standing over the patient in such a way as to have inhaled the breath. Lozenges of chlorate of potash, carbolic acid, etc., are also useful for this purpose. Lastly, I always personally give effect to a hint derived from a sanitary architect, who, whenever he is obliged to inhale any unpleasant effluvium, blows his nose freely, gathers his saliva, and expectorates.

Other prophylactic measures should include careful inspection from time to time not only of school buildings, but of the pupils, and that not alone for detection of those who may be the subjects of a sore throat likely to lead to diphtheria, but for efficient treatment of such as may be the subjects of chronic hypertrophy of the faucial and pharyngeal tonsils.

It is almost needless to add that the sick-room should be properly disinfected on the termination of every case of diphtheria, because this would come under the category of procedures to be adopted after notification of a case to the recognised authorities.

The Antitoxin Treatment.

Having treated of this subject at considerable length in the two editions of my monograph on *Diphtheria and its Associates*, as well as in many other separate contributions, there is no occasion to go over the whole ground, nor, indeed, does space allow. Suffice it to say that the theory of this treatment is based

on the fact that immunity to certain infectious diseases is possessed by certain animals, in whom, therefore, the toxins of the malady can be innocuously introduced. By transference of the blood of these *immune* animals so impregnated, immunity to infection can be conferred on animals which are *susceptible.* The transmitted serum has, in fact, qualities which are at once preventive and curative, the great advantage claimed, being that the action is also *immediate* albeit only *temporary.*

The procedure has up to now been for the most part more successful in diseases of animals than in those of man, but in none of the latter class has it been more striking in its effects than in the case of diphtheria.

When antitoxin was first introduced into this country some three years ago, I was at considerable trouble to study its effects, and I came to the conclusion that there was much to be desired before it could achieve all that was claimed for it, and for the following amongst other reasons:—

1. The great difficulty of obtaining a fluid of a uniform potency from animals liable to great varieties of resisting power, and consequently to considerable differences in their immunity-conferring power.

2. The difficulty of standardising the fluids thus obtained.

3. The early dictum that the treatment was only adapted to cases of pure diphtheria, and that associated organisms were antagonistic to its good effect.

4. The statement that no other treatment, nor even stimulant, was to be administered.

5. The question of dosage, whereby cures were claimed in early cases in which amounts were administered by the timorous, ridiculously small in comparison with those prescribed by the enthusiasts; these last in turn being considered equally inadequate in still later days.

Kassowitz of Vienna, in a recent series of brilliant lectures against the antitoxin treatment, thus delivers himself on this point:—

'In the halcyon days of serum-therapy the dose was not thought of, but estimates made since by Ehrlich and Kossel set the quantities down approximately at from 100 to 200 units. Sonnenburg had the best results with doses of from 160 to 200. In 1894, brilliant results were recorded, with reduced temperature and miraculous cures; though Behring, to one's surprise, has just stated in his later work, that the serum hitherto used was calculated at a standard five times lower than that now in use. A thousand units of the early serum, during the most brilliant epoch of its history, would thus represent but 300 or 400 units of the fluid at present used. According to this estimate, Ehrlich, Kossel, and Sonnenburg must have obtained marvellous results with 60 or 80 units of the present serum. At the present time we give 1500 units, 6000 units, 10,000 units up to 16,000 units, without knowing what a minimum dose is, or where the

limit is to be fixed, seeing that the best results appear to have been obtained when the dose was 60 units. The unprejudiced observer finds himself constrained to admit that the later increase of the dosage has not contributed to the success of the serum if a comparative examination of the numbers is to be taken as our guide.'

6. A certain unfairness in the comparative figures, by which cases not treated by the new remedy, on account of the disease being too advanced to warrant hope of benefit, were included in the statistics of those to whom the remedy was not administered.

When this error is rectified, the improvement due to antitoxin as practised in the Metropolitan Infectious Fever Hospitals for 1895 and 1896 is entirely dissipated.

Some of these objections are no longer in force, but some of them still remain active. In the meantime, it is to be noted that the presence of the Klebs-Löffler bacillus being now recognised as an irrefragable test of diphtheria[1]—the clinical criteria being often treated as subordinate—the numbers of cases of the disease are much greater than in former times, though the increase in numbers by no means represents an increase of fatal cases. The consequence is that, although in many countries and cities the relative mortality from diphtheria is stated to have been diminished since the more universal application of the bacteriological test, and under the use of antitoxin serum, the actual mortality remains unchanged for the better. Thus, to quote Photiadès—

It is not surprising that statistics have proved (1) that the serum treatment has almost suppressed mortality, (2) that since this treatment was begun, the mortality is as high as ever. Without considering the conflicting statistics of individuals, it has been shown that the serum has increased the mortality at Trieste, St. Petersburg, and Moscow; has diminished it enormously at Paris, Berlin, Vienna, and Buda-Pesth; and has had no influence on it at Leipzig, Milan, and London. In America, Coakley has shown for Boston, New York, and Brooklyn, (1) that the declared cases of diphtheria have increased enormously, (2) that though the relative mortality (percentage of declared cases) has diminished since the serum treatment, the absolute mortality calculated on the total population is as high as in the worst years since 1882.

Nevertheless, as the same author goes on to say—

Though the public demand that every clinician should have an opinion as to the value of serum, either for or against, statistics are perfectly useless up to now in helping him to form one. He must therefore fall back on his own resources, which are those of clinical empiricism. It is enough for him that the serum acts, and that chance has been excluded from the cases where it succeeds, that is, he must consider the individual, not masses of statistics.

No one who has seen the membrane clear up, the natural voice return if the nares

[1] There has always been a large number of practitioners who have denied the specificity of the bacillus, and there would appear to be a certain tendency to recant in some of those who have formerly given their adherence to it, if one may judge from a remark in a recent lecture by Kassowitz, that '*it is now generally admitted that Löffler's bacillus is not the exciting cause of diphtheria.*'—*Med. Press. and Circular*, June 15, 1898, paper 621.

are involved, and convalescence begin within forty-eight hours, in a case which experience shows to be very severe, can doubt the good done by serum. Its failure in certain cases is no reason for doubting its use. Everything points to the fact that diphtheria toxins vary greatly in virulence, and it is possible that bacteriology may prove eventually that some diseases considered absolutely specific, are not so. For this, theories of bacterial symbiosis have prepared us, and Windrath has shown that there is nothing specific in the toxins of specific bacteria. It accords with this, that the author has often used the serum in cases which were clinically severe diphtheria, but where bacteriology showed streptococci to be in the majority, with as much success as in those caused by Löffler's bacillus alone.

Photiadès is thus evidently a believer in antitoxin. But the figures of Professor Kassowitz, who is incredulous of its merits, are equally strong.

This author says of St. Petersburg, where 'enthusiasm in the potency of serum-therapy is still unbounded,' that not the relative but the absolute death-rate in 1897 has reached the enormous figure of 1905 deaths, or six times the mortality of the ante-serum era (333 for 1892).

There is a fair consensus of opinion—not shared, however, by Kassowitz for one—as to the benefit of the serum in laryngeal cases, as shown both in a diminished necessity for tracheotomy, and in better results in those cases which require the operation. But in this as in the whole question, insufficient allowance is made for the general improvement in all cases of diphtheria, as well as in all operations, as a result of better hospital surroundings, nursing watchfulness, and general hygiene.

Method of administration.—It only remains to give a few

FIG. CCXXXVII.—ROUX'S SYRINGE FOR ANTITOXIN, SHOWING HOW EACH SEPARATE PART CAN BE DISJOINTED FOR THE PURPOSE OF DISINFECTION.

directions as to the employment of the remedy. The great principle involved is the strict observance of every antiseptic precaution. The site of the injection is either the lower lumbar, the inguinal, or

the intra-scapular. The minimum first dose is 1500 immunising units, which is repeated as circumstances demand; nor does any age variation of amount appear to be recognised. Opinion has entirely changed as to the use of concurrent remedies, and no measure that has already been detailed, either local, general, or dietetic, in the treatment of diphtheria is now neglected, so that even the most zealous apostle of the new school must admit that the serum, however specific its therapeutic action, is but an adjuvant to and not a substitute for, the older remedies.

It is perhaps unnecessary to explain how the treatment acts. In common with Grawitz and others, I am inclined to believe that the major share of the advantage lies in the dynamic properties of the blood-serum itself. Soerensen has indeed urged that at least equal benefit to that obtained by antitoxin might result from the injection of normal saline solution. Such an opinion can be the only justification for the employment of diphtheria antitoxin for non-diphtherial diseases, the list of which already includes such incongruous maladies as tuberculosis, sciatica, sarcoma, lupus, Hodgkin's disease, pelvic inflammation, typhoid fever, ozœna, and asthma. This practice represents a line of therapeutics calculated to cast ridicule not only on all specific antitoxins, but also on the science of bacteriology.

CHAPTER XXII

SYPHILITIC LARYNGITIS

(*Open out* PLATE IX. *at end of the Book, during perusal of this Chapter*)

THE mucous membrane of the larynx may exhibit the specific manifestations of the disease in either the secondary or tertiary stage; it is also, though rarely, seen as the result of hereditary transmission.

Syphilitic laryngitis is present in only a comparatively small proportion of cases of all varieties of throat disease, but syphilographers differ so widely as to the ratio in which the larynx is implicated, that no useful conclusions can be drawn from their figures. According to Lewin, the larynx is affected in 4.8 per cent. of all cases of syphilis, whilst Willigk gives 15.1, Roth 32, and Sommerbrodt 34 per cent. as the proportion.

Hospital Statistics of Relative Frequency, as prepared for this volume, show that syphilitic laryngitis occurs in this country in about 1.5 per cent. of all diseases of the throat and larynx; while the relationship of the varieties to the whole number is of hereditary syphilis about 1 per cent.; secondary, about 30; and tertiary, about 70 per cent.

The great frequency of specific laryngeal inflammations is described by Gerhardt as largely determined by fortuitous catarrhal inflammation, and the experience of all laryngoscopists in hospital practice will confirm this view; whilst an influential predisposing cause of advanced syphilitic disease of the larynx is the apathy and neglect with which, after long existence, such affections are treated. A badly nourished state of the body is another influence tending in the same direction, and accounts in a measure for the greater severity of the disease among the poorer classes.

SECONDARY SYPHILIS (Figs. 77 and 78, PLATE IX.).

The larynx may be affected in this stage of the disease at any time from six months to two years after exposure to the

primary infection. All authorities agree that it may occur either as an extension from the pharynx, or, as is more commonly the case, independently of the pharyngeal manifestation. The truth of this last suggestion is evidenced by the fact that the larynx is generally first affected after the disease in the pharynx has been cured, or without the latter ever having suffered to such an extent as to call for medical aid. While the characteristics of secondary inflammation in the larynx are by no means so differentially distinctive as are those in the fauces, it may be broadly stated that the probability of the larynx becoming implicated stands in direct ratio to the duration and virulence of the infection, and in a large degree to prompt and persistent adoption of appropriate therapeutic measures from its first manifestation.

Secondary syphilis in the pharynx is almost invariably accompanied by cutaneous eruptions, whereas if the latter have ever been noticed, they will usually have disappeared many months before the larynx is affected.

The mucous patch, so common an evidence of secondary syphilis in the fauces, is by no means a constant product of syphilitic inflammation occurring in the larynx; nor is such inflammation or patch invariably, or indeed usually, symmetrical. Loss of tissue is infrequent, and ulceration, which seldom extends beyond erosion of the epithelial layers, occurs at points likely to be subjected to irritation from the passage of food or from mutual contact in vocal exercise.

Condylomata not infrequently occur in various situations in the larynx—notably on the epiglottis. Their presence is denied by some observers, while others estimate their manifestation in proportions varying from 1 to 36 per cent. These differences depend partly, as Morell Mackenzie has said, on the time of year that examinations are made, and partly, it may be added, on the limit ascribed to the secondary stage.

Contrary also to the experience of some observers, I have seen not a few cases in which condylomata have developed into formations that were, to all intents and purposes, warty growths; nor can I agree that such formations have in the larynx, any more than on the skin, a tendency to spontaneous subsidence *at points where irritation is constant.* All secondary syphilitic affections of the larynx are characterised, as are those associated with the same dyscrasia in other parts, by rapid amelioration under appropriate treatment, but by an equally strong tendency to relapse. This fact is often of great diagnostic value in doubtful cases of chronic laryngitis.

With regard to this disposition to relapse, Whistler has called deserved attention to the '*relapsing ulcerative laryngitis*' which marks what he has called the intermediary stage of syphilis. In this condition the ulcerations, though more superficial than in the true tertiary stage, imply a deeper loss of tissue than in the more commonly seen erosions of the true secondary period. They probably indicate not only a more pronounced specific taint, but are also determined by a greater degree of adventitious inflammation of the larynx in the first instance.

SYMPTOMS: A. **Functional.**—Under the influence of atmospheric or other severe exciting cause of laryngitis, the **voice** of a syphilitic person is much more liable to be completely lost, and is restored less quickly and completely than in a non-specific case. It may be stated generally that alteration of this function is characterised by early and very persistent husky hoarseness. When once appreciated, the raucous syphilitic voice is so distinctive, that the practised ear will recognise the disease as soon as the patient speaks.

Vocal exertion always increases the dysphonia, and the singing voice is entirely destroyed for the time; it is, indeed, doubtful whether a vocalist who has once suffered from syphilitic congestion of the vocal cords ever regains complete purity of tone, submucous changes, slight though they may be, preventing perfect co-aptation and co-ordination of those structures.

Respiration is but seldom embarrassed, but the breathing is frequently described by the patient as wheezy. Extension of the inflammation into the trachea and larger bronchi is common, and on auscultation of the chest, râles may often be heard.

Cough is only occasioned by the desire to clear away expectoration, or after the irritation caused by talking or eating.

Pain, except a sense of effort in the use of the voice, is rarely experienced in the earlier forms of laryngeal syphilis.

B. **Physical.—Colour.**—On looking into the larynx of a patient suffering from secondary syphilis, one is struck first by the somewhat—not always, however, well defined—mottled discoloration, and secondly by the fact that the hyperæmia does not appear to be so superficial, nor so vivid in colour, as in simple chronic inflammation. This distinctive appearance is more particularly evinced on the vocal cords, which are observed to be more or less congested, in patches of varying intensity, the non-hyperæmic portions being of a greyish tone. Mucous patches when present are visible most frequently on one or other ventricular band, on the free edge of the epiglottis over the arytenoid

cartilages, and at the posterior commissure. Gottstein well describes the appearance of mucous patches as that of 'round or elongated greyish white spots of thickened epithelium, slightly raised above the congested tissue which surrounds them, and either sharply circumscribed from this or shading gradually off into it.'

Form and Texture.—Beyond some slight want of equality in muscular action, there is seldom alteration of form. Condylomata are occasionally seen on the inter-arytenoid fold, and on the free edge or lingual surface of the epiglottis. In long-standing cases, and when the voice is unduly exercised, there may be loss of surface-tissue on the arytenoid cartilages and on the vocal processes. It is comparatively rare to find erosion of any other portion of the vocal cords.

Secretion, in secondary syphilis, is scanty and viscid, the patient frequently making a point of complaint that the cough is very dry.

C. **Miscellaneous.**—External signs of syphilis on the skin are often wanting, for the reasons already given, and they may have been so slight as to have entirely escaped the notice of the patient. The most uniform corroborative symptom is that of post-cervical glandular enlargement, but this cannot be said to be by any means universal. In fact, the surgeon will often be at a loss to arrive at a distinct conclusion as to the nature of the disease from the usual commemorative signs, especially in the case of those patients (married women, for example) to whom it is inadvisable, for ethical and family reasons, to address questions that might possibly arouse painful suspicions. In such cases, reliance must be mainly placed on the results of physical investigation of the larynx itself.

The general health is of course tainted by the specific poison, but it does not suffer to the same extent as in the earlier or in the much later epochs of the disease. Thus there is seldom much variation in temperature, though there may be slight fever at night; the surface temperature may be ordinarily rather increased, and the perspiration somewhat scanty. All the symptoms suffer some nocturnal exacerbation.

PROGNOSIS.—The course of the disease under treatment is favourable, though, as intimated above, the chances of a permanent loss of singing voice, or of the persistence of hoarseness, must not be overlooked, nor the possibility of the development of hyperplasic formations.

There is a strong disposition to relapse on the slightest

catarrhal provocation, and this tendency is somewhat increased during the time the patient is under active treatment.

TREATMENT: **General.**—A mild mercurial course is necessarily indicated, and is most serviceable. The Turkish bath, followed by the calomel vapour-bath or by moderate mercurial inunction, is of great value, both for its general and local effects.

Whenever condylomata appear, or when there is any symptom of ulceration, iodide of potassium or sodium, with or without mercury, is indicated.

Local.—Stimulating inhalations of precisely the same character as were recommended in simple chronic laryngitis, are of the first importance. Wet compresses impregnated with iodine, and mercurial ointment with iodine and belladonna (Form. 82), have a decidedly beneficial effect.

Topical applications to the interior of the larynx are of far greater value than in simple chronic congestion, and must be pursued with greater regularity and perseverance, even after the inflammation has disappeared from the vocal cords. Allusion has already been made to the absence of warrant for the traditional preference of the profession for nitrate of silver in laryngeal disease. This remedy should only be applied when there is actual ulceration. Solutions of chloride of zinc or aluminium, iodide of zinc, and of sulphate of copper (Form. 58), are, in my experience, the most useful local applications in secondary inflammations; alternation of the solutions frequently having a great effect in promoting the cure. As a rule, these solutions are better applied as continuous sprays generated under compressed air, the stream being directed by the mirror, than as pigments on a brush. In very obstinate cases, spa treatment at Aix-la-Chapelle or Bagnères de Luchon may with advantage be prescribed.

Hygienic and Dietetic.—The indications are to give rest to the voice, and to avoid exposure to all catarrhal influences of atmosphere; irritative articles of nourishment should be carefully avoided.

TERTIARY SYPHILIS (Figs. 79 to 88, PLATE IX.).

This form of syphilis is characterised by ulceration of a highly destructive character, causing permanent loss of tissue, and followed by resulting cicatrices, which may either directly produce great narrowing of the larynx, or may be accompanied by new deposit having the same effect.

Tertiary syphilis occurs in the throat as one of the latest

manifestations of the disease, and is often seen twenty or thirty years, or even at a still later period, after the primary infection. It may first attack the deeper parts of the larynx, or may invade that region as an extension of the disease from the fauces, in which case it very seldom advances beyond the epiglottis; under these circumstances, there is neither much thickening nor displacement, nor any great amount of trouble in the performance of function.

From the velum, or posterior wall of the pharynx, the disease very seldom descends into the larynx, and cases may frequently be seen with the whole posterior wall of both the oro- and naso-pharynx the seat of deep ulceration, but with the larynx absolutely free from any sign of ulceration; in such cases, although articulation is affected, the phonetic quality of the voice remains unimpaired.

These remarks hold good also with respect to congenital syphilis in the larynx, which will be presently considered.

Case XCIV.—I, however, remember a case, seen in my early days in the clinic of Morell Mackenzie, in which it appeared possible to believe that the patient, a young man of 22 or 23, was the subject both of hereditary syphilis and of the same disease in the acquired form. His father was under treatment for tertiary laryngeal manifestations, while the younger man, having characteristic teeth and physiognomy, and with cloudy corneæ, had been under medical care for palatal ulceration. He admitted the primary infection, had the scar of a chancre, and some years after his first appearance as a patient suffered from syphilitic invasion of the larynx.

It is not easy to affirm that the ulcerative process is always the result of degeneration of gummatous deposit, since the patient frequently does not come under observation until loss of tissue has already taken place; but from the appearance of those ulcers which are the undoubted sequelæ of gummata, it seems probable that such is the usual origin of laryngeal tertiary ulceration.

The epiglottis, subjected as it is to greater irritation than any other part of the larynx, is the portion most frequently attacked; but it cannot be said of any one part that it is more prone than the rest to the destructive process. Gottstein, however, places the vocal cords as the tissues most often attacked, then the epiglottis, and lastly the posterior commissure.

Symptoms: A. **Functional.—Voice.**—This is frequently not at all, or but very slightly, affected when the epiglottis only is attacked; and it is quite restored when disease, limited to that valve, is healed. Usually, however, permanent hoarseness, and even aphonia, is a prominent symptom.

Respiration may not be affected even when there is considerable and active ulceration; but on cicatrisation, embarrass-

ment of respiration is a frequent as it is a most alarming symptom. Difficulty of breathing may also be due to actual narrowing of the glottic space by œdema of a slowly subsiding and readily relapsing character, and also by the formation of cicatricial adhesions and new growths; it may further depend upon infraglottic stenosis of the same character, or upon constriction of the trachea just above the bifurcation, that being the most common seat of tracheal stricture.

Another cause of dyspnœa is a mechanical one, and arises from fixation of one or other arytenoid cartilage by fibrous deposit around the articulation. Several instances of this kind have come under my observation. In such a case, the vocal cord of the affected side will be seen to be paralysed, as if from pressure on the recurrent nerve; the respiration, however, will be less impeded, and there will not be the paroxysmal exacerbations so characteristic of nerve-pressure.

Attacks of dyspnœa will, of course, vary in character according to their cause. When due to stenosis, there will be stridor on exertion; and on the occurrence of a quite slight catarrh, alarming attacks which partake of all the characteristics of an asthma. The patient may recover from one of these attacks and enjoy comparative immunity from recurrence; but usually the seizures return and the intervals of remission become gradually shorter, until at length the dyspnœa is so extreme and persistent, that life is threatened by exhaustion or by asphyxia.

Syphilitic laryngeal œdema has been already considered in the chapters on œdematous inflammations, and on perichondrial changes. As pointed out in the latter section, extrusion of a cartilage by no means necessarily follows on degeneration; for the cartilage not infrequently becomes imbedded in connective or fibrous tissue.

Cough.—In the ordinary course of active tertiary inflammation there is nothing to call for special remark in this symptom, except that the expectoration is of a distinctly muco-purulent character, and often contains portions of disorganised tissue; in which latter case there may be more or less hæmorrhage. Portions of the tracheal rings, or of the laryngeal cartilages, or even a whole arytenoid cartilage, may be expectorated.

When the air-passages are narrowed, the cough partakes of the characteristics of the advanced stage of œdematous laryngitis, with stridulous inspiration, intense spasm, and a varying degree of aphonia. When there is constriction of the trachea, the sound of the cough cannot be mistaken; it resembles more than

anything else that of laryngismus stridulus, or of whooping-cough.

The expectoration in these cases is of the scanty glairy character seen in asthma, and, as in that disease, relief is not experienced until the secretion imprisoned at the constricted spot is liberated.

Deglutition.—This is naturally impaired when the epiglottis is attacked, though it is surprising how much of that valve may be lost without interference with the act of swallowing, provided the pharynx be also not involved. **Dysphagia** is much more frequently experienced when the pharyngeal border of the posterior wall of the larynx is actually diseased. After-thickening of the epiglottis does not appear to affect deglutition, and almost the whole of this valve may be destroyed without any impairment of function. **Odynphagia** is rare, and the same may be said with regard to **pain** generally, unless there be perichondrial inflammation; indeed, this absence of pain has come to be regarded as a symptom of differential importance.

B. **Physical.—Colour.**—The natural colour of the general surface of the larynx is markedly increased in intensity. After the ulceration has healed, the laryngeal mucous membrane loses its original delicate semi-transparent hue, and is seen to be of an opaque dullish red. Sometimes this redness is modified by a blue-greyness of tone. It will be noticed, for example, that the normal warm buff-colour of the epiglottis is lost, and that this part will look as if of exactly the same structure as the arytenoid cartilage. The ary-epiglottic folds will appear as solid as the ventricular bands, and the vocal cords will be changed in appearance by the loss of their pearly lustre. Sometimes in the stage of acute inflammation, the cords, instead of displaying their normal firmness, will have the consistence and colour of active granulations. When the disease has become very chronic—that is to say, when a long interval has elapsed since the last inflammatory attack—the whole surface of the larynx often acquires a greyish or yellowish and—so to speak—bloodless appearance in consequence of submucous changes.

Gummata in the larynx have been described by Mandl as having a greyish yellow tint, but by Türck and others as being of the same colour as the normal mucous membrane. As seen by myself, they have generally exhibited decidedly increased vascularity when occurring on the ventricular bands, inter-arytenoid folds, and arytenoid cartilages; when on the epiglottis, they appear as nodes of a somewhat less vivid tint than the congested

surface from which they spring. Prior to breaking down, gummatous swellings sometimes assume a yellowish hue at the central and most superficial point.

Form and Texture.—The order of appearances under this head will be thus: — Loss of tissue, thickening, cicatricial narrowing.

When there is *loss of tissue*, the characteristics of the tertiary syphilitic ulcer in the larynx are nothing less than typical, and cannot be better described than in the words of Türck. The ulcer has 'a more or less circular form; a deep floor covered with a whitish yellow coating; and sharp, sometimes strongly elevated margins, surrounded by an inflammatory areola.' It need only be added that the margin is hardly circular, but appears of a multiple crescentic form, in this respect somewhat resembling the manner in which the mucous patches appear on the pharynx in the secondary stage. A comparison of the PLATES III. and IX. will at once illustrate and elucidate this point.

When the edge of the epiglottis is ulcerated, it is eaten out in distinct notches with clean edges; and the disease will proceed, by the way of the ary-epiglottic folds, to extend to the rest of the larynx.

The secretion of the ulcers is not at first very profuse, and is then pale in colour and of creamy consistence; but when the cartilages become attacked, there is free purulent discharge, having the characteristic odour indicative of caries.

The *thickening* due to tertiary syphilis which is seen in healing, is as distinctive as the ulceration which precedes it, occurring, as it does, as a sequel of ulceration, instead of being a forerunner of that process, as in phthisis; and being of the nature of excessive activity of growth at the periphery of the ulcer, with marked lack of productiveness at the centre. We have, as a result, contracting cicatrisations of dense, fibrous, unyielding character, very difficult to reduce, and very apt to re-develop on division and dilatation. (See Figs. 86 and 87, PLATE IX.)

Cicatricial narrowing of the larynx is attended, as we have seen also to be the case in œdematous swelling of the same region, with the greatest danger to life, and for somewhat similar reasons, namely, that there is not only direct narrowing of the air-passages, but also very frequently a superadded impediment to the free action of the vocal cords.

A case (XCV.) is delineated as Fig. 88 in PLATE IX., in which the left arytenoid cartilage having been expelled as a result of ulceration and caries, the corresponding vocal cord became paralysed and then atrophied.

Position, or the relative situation of the various parts of the larynx, may be greatly altered by cicatricial deformities. Outgrowths from the pharyngeal wall are often observed. They are occasionally of very eccentric shapes, and not uncommonly advance across the laryngeal opening, but they seldom exercise compression. In this respect they differ greatly from a malignant encroachment of the pharynx on the larynx.

C. **Miscellaneous.** — There is seldom any external local swelling of the larynx, except in occasional cases of perichondritis. The constitutional symptoms need not be dwelt upon, except to say that the absence of cachexia, so frequently to be noted, is of marked diagnostic value in differentiating this affection from phthisis and from cancer.

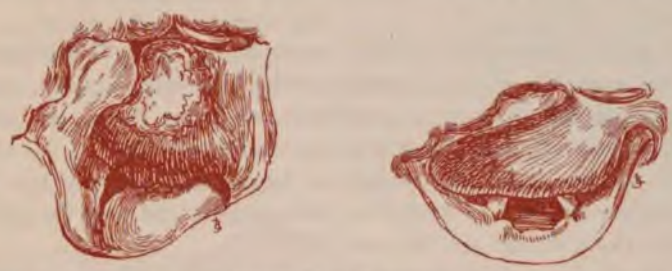
PROGNOSIS.—This must always be guarded when there is the least evidence either of perichondritis or of stenosis, and especially if, in the former case, the cricoid cartilage is attacked. Death may result from acute œdema of the larynx occurring suddenly during the active ulcerative process. Another possible fatal termination, fortunately not a common one, is that of hæmorrhage.

If, however, the disease comes sufficiently early under the notice of the surgeon, a very favourable opinion may be given, both with reference to life and to modified restoration of functions. Ulceration of the epiglottis, of the arytenoid cartilages, and even of the vocal cords, will heal with almost marvellous rapidity under properly directed treatment, and the worst result to be anticipated is some slight discomfort in deglutition, or a permanently hoarse voice.

The following is an interesting example of the insidious mode in which syphilis may attack the larynx; it also will illustrate the happy results of treatment:—

CASE XCVI.—Mrs. O., æt. 39, married eleven years, was first seen on March 8th, 1882, on account of difficulty and pain in swallowing, which had existed for ten months. At first the dysphagia had been greatest with fluids; now solids were swallowed not only with difficulty, but with pain. Her voice had been lost for five months, breathing was somewhat short on exertion, and she was troubled with distressing cough, accompanied by slightly sanguineous expectoration. She had become greatly emaciated, and her weight had been reduced from 154 lbs. to 99 lbs. One child had been born and was alive, aged 10 years; but no further conception had occurred until about four years previous to her visit. Since then there had been three miscarriages. The patient was sent to me as the subject of either phthisis or carcinoma, but with the laryngoscope the nature of the case was at once revealed (Fig. CCXXXVIII.). Not only was the whole larynx greatly swollen, but the epiglottis was both thickened and inflamed in an intense degree. Fully a third of this valve had been destroyed, and the ulcerative process was still advancing. The patient was at once ordered 15 grains of iodide of potassium with 10 grains of bromide of potassium three times daily, and frequent steam inhalations of benzoin and chloroform (Form. 28). The solid nitrate of silver was applied daily, for ten days, to the ulcerated

surface with the aid of the laryngeal mirror; when, the destructive process being checked, a solution of sulphate of copper (Form. 61) was substituted, and biniodide of mercury was given internally. In forty days the larynx had assumed the appearance depicted in Fig. CCXL. The patient could eat well, and had gained 9 lbs. in weight. The



FIGS. CCXXXVIII. AND CCXXXIX.—TERTIARY SYPHILITIC ULCERATION OF THE LARYNX.

(The first drawing represents the condition on commencement of treatment; the second, five weeks later.)

after-history, under modified mercurial treatment, was one of continued improvement, and six months later she had further recovered flesh so that the scale indicated 142 lbs. A very interesting feature was the drawing over of the epiglottis towards the right side, an effort of nature to overcome the gap formed by the ulceration.

TREATMENT: **General.**—During the active stage of ulceration, the administration of the iodide of potassium or of sodium (Form. 94) is in the highest degree beneficial. Seeing also that the majority of the worst cases occur in very poorly-fed persons, cod-liver oil and iodide of iron are of therapeutic value. In other cases the iodide may be occasionally intermitted, and cinchona with ammonia, or acid, substituted. Whenever patients resist the iodides, a systematic course of 20 to 25 mercurial inunctions should be employed. When the ulcerations are healed, some preparation of mercury must be given for a lengthened period, as a prophylactic against future attacks (Form. 91, 103).

Local.—There is no better topical remedy for syphilitic ulcers than nitrate of silver, which must be applied *daily* with the aid of the laryngoscope. If there is much secretion over the ulcer, it should be first removed by means of a spray or soft moist brush, or by a piece of absorbent cotton-wool on a suitable holder.

When the ulceration is of the epiglottis, the galvano-cautery acts more rapidly in arresting the destructive process than even nitrate of silver.

Laryngeal œdema must be met by the prompt performance of **tracheotomy,** unless it quickly yields to medical treatment. Tracheotomy may also be necessary, at least as preliminary to other measures, if stenosis becomes extreme.

The cannula should always be inserted at the lowest possible point in the trachea, and should on no account be removed, however favourable the symptoms may appear, unless laryngoscopic examination gives evidence that the physical obstruction is lessened.

At a very early period after tracheotomy, it will be well to make an opening in the superior surface of the cannula, and to allow the patient to wear a pea-valve, so as to favour a natural process of dilatation by means of the current of air.

It is well to warn the patient on whom tracheotomy has been necessary on account of syphilitic stenosis, that he may be obliged to retain the cannula for the rest of his life.

With respect to the further treatment of cicatricial stenosis, it is not my practice to *invariably* perform a preliminary tracheotomy, as is counselled by Schroetter, but it is decidedly advisable to have all instruments for that operation ready to hand whenever attempts are made to divide a cicatricial web by a cutting instrument, or to dilate the narrowed orifice by bougies or analogous measures carried on through the natural passage.

Direct treatment of membranous stenosis of the larynx, whatever its nature, by surgical means is very tedious, and often very discouraging; but this is especially the case when the web is the result of syphilis.

Although isolated cases, more or less successful, had from time to time been reported, even in pre-laryngoscopic literature, there can be no doubt that to Schroetter is mainly due the merit of perseverance with systematic dilatation by means of tubes and hollow catheters of gradually increasing dimensions passed from above, tracheotomy having been previously performed. The tubes are directed to be retained in position for from fifteen to thirty minutes. Schroetter has reported several successful cases, and others have occurred in the practice of various surgeons, especially Heryng of Warsaw, who is an enthusiastic follower of Schroetter's method, and has contributed a valuable essay on the subject. The process is, however, very slow, and involves in some instances a constant treatment for eighteen months or even longer, and, in the majority of cases, the wearing of a cannula for life. Stöerk uses a dilator which is attached to the upper part of a tracheotomy tube, distension of the constriction being thus made from below and without the passage of any instrument by the mouth. Navratil has invented an elaborate dilator for rapid dilatation, but this procedure is no more successful in the larynx than in the urethra, and is attended by similar risks of acute

inflammation. Whistler, in an interesting and complete monograph on this subject, has drawn attention to the fact, previously noticed by Liston and Trendelenburg, and in accordance with general experience, that long retention of a tracheotomy tube is often attended by a certain amount of collapse of the larynx, and by atrophic paralysis of the dilating muscles of the glottis. Partly on this account, and partly for obtaining more permanent results than are usually afforded by simple distension, Whistler 'devised an instrument which should combine the properties of a knife and dilator in one.' This laryngotome (Fig. CCXL.)

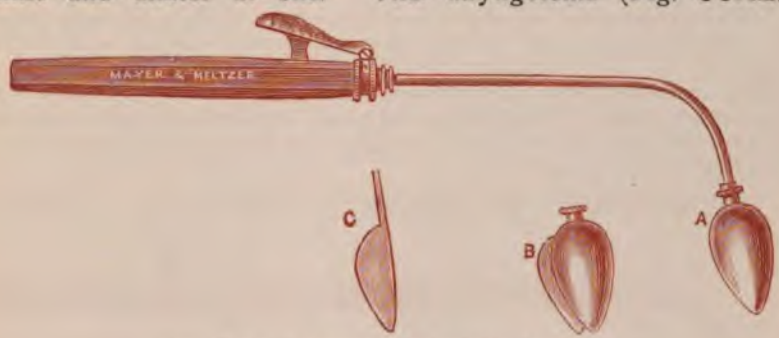


FIG. CCXL.—WHISTLER'S CUTTING DILATOR.

is composed of an almond-shaped dilator (A), within which is a concealed blade (C). This blade is reversible, so that it may divide a stricture either at the anterior or posterior commissure of the larynx, and its position is controlled by means of a lever attached to the handle (D).

I have myself employed Whistler's instrument in two cases; in both there was considerable improvement, and in one, indeed, complete and permanent relief. The following are the chief features of the first:—

FIGS. CCXLI. AND CCXLII.—CICATRICIAL STENOSIS BEFORE TREATMENT. THE SAME AFTER USE OF CUTTING DILATOR.

CASE XCVII. — Sarah S., æt. 37, married, applied at the hospital on April 27th, 1885, on account of loss of voice, which had existed for fifteen months, and had more recently been accompanied by a sense of suffocation and of obstruction in the throat, which had occasioned some difficulty in swallowing.

Her family history showed that her father died of phthisis. She herself had had five children, three of whom were living: one had died from bronchitis, and one as the result of an accident.

Examination of the larynx (Fig. CCXLI.) showed an inflammatory cicatrix along

the cushion of the epiglottis, and a tight fibrous band uniting the vocal cords along the anterior two-thirds of their free borders, and reducing the glottic chink to the calibre of a goose-quill. The left vocal cord was inflamed, and the left side of the larynx generally was thickened. Her respiration was audibly harsh and whistling, but regular during the day; there was dyspnœa on slight exertion, and at night, even during sleep, there was loud inspiratory stridor. Slight dulness was found over both apices, with prolonged and high-pitched expiration. She had lost flesh lately, and her weight on admission was 96 lbs., her height being about 5 feet 1 inch.

She was ordered to wear a Leiter cold coil over the larynx, to inhale benzoin and chloroform vapour (Form. 28) three times a day, and to take 10 grains each of iodide and bromide of potassium also three times daily, with a larger dose of bromide at night. Later, she was ordered nightly inunctions over the larynx of mercury and belladonna ointment (Form. 82).

Whistler's dilator was employed twice a week, a large cotton-wool probang charged with sulphate of copper solution being passed through the constriction on intervening days.

The improvement in her larynx in six months is represented by Fig. CCXLII. At this time her voice had returned, but was still hoarse. Her breathing was easy and quiet, both night and day. She had gained in strength and in weight, and continued to attend from time to time as an out-patient.

Although in this case there was no direct history of syphilis,

FIG. CCXLIII.—AUTHOR'S HOLLOW LARYNGEAL DILATOR WITH CUTTING BLADE (⅓ measurement).

A, terminal of the hollow dilator, containing the cutting blade (B), the extent of which is regulated by the screw at D. E E show openings for passage of air.

the result of treatment leaves little doubt as to the nature of the disease.

Being of opinion that the difficulties of passing tubes into the larynx, and especially through a cicatricial stricture, are much greater than is generally stated, I have had constructed an instrument which combines the advantages of the hollow tube of Schroetter and the cutting dilator of Whistler. Thus the surgeon, while always sure, by the outward passage of air, when the hollow instrument is in the larynx, is able to incise with more certainty as to what he is cutting, and moreover, in case of spasm, the air-passages are not entirely obstructed. This instrument, which is figured above, requires no description. It is no longer than Whistler's, and, like his, the cutting-edge of the blade is made

reversible; in addition, the amount of blade can be regulated by the screw at D. The instrument was used with satisfactory results in the later stages of Case XCVII., and in many since.

Unsatisfactory though the results of cutting and dilatation of chronic laryngeal and tracheal stenosis undoubtedly are, I am fully in accord with Whistler that medication by drugs is entirely useless; though in the case of *recent* stenosis—glottic or sub-glottic—iodides and mercury occasionally give good results.

Where dilatation failed, I would certainly prefer a **tracheotomy** to resection of a portion of the larynx as practised by Heine, Bruns, and others.

There are two stages of *syphilitic laryngitis*—I might add *tracheitis*—in which the question of tracheotomy has to be considered. The first is that of acute œdema, which is so common an occurrence in the earlier tertiary period. This œdema may occur during the ulcerative process, or it may be due to development of a gumma, or to perichondritis, and will often, as has already been indicated, be reduced by prompt and appropriate constitutional measures. In no disease will the surgeon who uses the laryngoscope both intelligently and diligently have a more gratifying reward for patient watching and perseverance in treatment. Of such a fact the experience of all specialists will afford examples.

CASE XCVIII.—I will mention one of several in which a patient—I need hardly say an hospital one, for private patients are seldom so constant—has attended me weekly or fortnightly for nearly five and twenty years. Twice he has been taken to a general hospital and threatened with tracheotomy, but he has been now free from acute attacks for nearly ten years. He is the subject of more or less glottic stenosis, for which he is treated by the passage of a large cotton-wool brush, charged with a solution of sulphate of copper.

Supposing tracheotomy to be called for in such a case of œdema, there is a reasonable hope that the tube may shortly be dispensed with. A pea-valve may always be very early employed, and the sooner an orifice is made in the upper aspect of the tube the better.

CASE XCIX.—Some years ago I saw in consultation and assisted in the operation and treatment of a colonel in the army, under the care of Mr. Nunn, in which case, after three months and for a period of nine, the patient gave the word of command with the tube in his throat, and was enabled to dispense with it permanently at the end of a year.

The second phenomenon in the course of a syphilitic tracheitis for which tracheotomy is indicated, is that of stenosis, and this is usually infra-glottic in position. It occurs at a quite late period, ten, fifteen, twenty, or even thirty years after the primary

infection, and is due either to deforming cicatrices or to the development of fibroid tissue at situations not necessarily the seat of previous ulceration. Without doubt these cases are becoming less frequent, and will become still more rare, as the use of the laryngoscope and *topical*[1] laryngeal medication become more general. They are at the present day much more uncommon in the United Kingdom than in Austria-Hungary and Poland; whether this circumstance is due to causes racial, climatic, hygienic, or dietetic—I speak more especially of the use of raw spirits—is not now a question to be considered; but it is important to note that the treatment adopted also differs essentially, or at least yields very different results. I suppose few of us can claim many such cases of sub-glottic and tracheal stenosis as are reported by Schroetter of Vienna, Navratil of Buda-Pesth, or Heryng of Warsaw. I confess that I have seldom had a case in which attempts at mechanical dilatation, *without cutting*, have not rather increased the distress and precipitated the tracheotomy by promoting suffocative spasms of a serious grade; nor have I, after opening the windpipe, been much encouraged to persevere in mechanical dilatation with any hope of being able to remove the tracheotomy tube. I believe it to be better—certainly more humane—surgery, whenever we are convinced that there is an obstinate stenosis due to syphilis, to perform an early tracheotomy, and to advise a life-long retention of the tube. I have only to add that the lower the tracheotomy can be made in such a case the better, for nothing is more deceptive than the (apparent) high situation of a stenosis as viewed by the mirror, and nothing more distressing than the disappointment so frequently experienced of finding that our tube has not reached the stricture; or if it has relieved an upper one, its introduction has been rendered useless by the existence of another at a lower level.

O'Dwyer has reported five cases in which intubation has been serviceable in the adult. His tubes for the purpose are constructed of metal, similar to those for children, the large ones of vulcanite, and they have been worn for periods varying from a few days to several—in one case ten months. Deglutition is comparatively easy after the first day or two. Dr. O'Dwyer kindly gave me the first instruments he had made for this pur-

[1] The word 'topical' is emphasised here, because, while I am ready to admit that many cases of syphilitic inflammation and ulceration in the larynx can be healed by appropriate general treatment alone, it is only by carefully directed topical procedures that deforming cicatrisation, so generally the result of the healing process, can in any degree be controlled.

pose, and I have employed the method, with encouraging results, in two examples.

In some cases the constriction is in the trachea, and is seldom then within reach of the surgeon. Such a condition may be due to compression by an enlarged thyroid or other gland, by an aneurysm or other new formation, or may be caused by interstitial thickening, of which the two principal causes are syphilis and rhinoscleroma. In the former cases, while intra-tracheal incision is contra-indicated, dilatation is useless, and even dangerous; in any circumstance, division is sure to be followed by but very partial and temporary relief.

CONGENITAL SYPHILIS OF THE LARYNX.

In my remarks on 'Congenital Syphilis in the Pharynx' (p. 283), I have referred to the classical essay of John N. Mackenzie as the earliest contribution in laryngoscopic times to attract attention to this important and previously unexplored subject; but independently of that circumstance, it will, on its own merits, always stand as a permanently valuable addition to our knowledge of laryngeal disease, and, as such, it will repay careful perusal. There is doubtless much force in the conviction of this author, 'that laryngeal lesions (in connection with congenital syphilis) have not been found more frequently, simply because they have not been sought'; but I am bound to say that in the time which has elapsed since his article was written, the joint experience of my colleagues and myself has failed to confirm his statement 'that laryngeal disease is not rare in congenital syphilis; that it is one of the most constant and characteristic of its pathological phenomena; and that we may look for invasion of the larynx with as much confidence in the congenital as in the acquired form of the disease.'

On the contrary, while readily conceding that many cases of *chronic superficial laryngitis*, as well as of *relapsing tracheal and bronchial affections in infantile life*, are much more often associated with the syphilitic dyscrasia than is generally suspected, we do not see *chronic interstitial laryngitis*, nor *deep, destructive, ulcerative laryngitis*, as ordinary, frequent, or in any sense typical evidences of congenital syphilis; though cases exhibiting characteristic appearances in the palatal and naso-pharyngeal regions, whether as early or tardy evidences of congenital syphilis, are of almost daily occurrence in our practice.

Monti states that he has twice seen laryngeal syphilis, which

arose during intra-uterine life; but, looking at the absolutely passive part played by the organs of respiration previous to birth, such a circumstance must be very rare, and the same may be said of so-called congenital webs, hyperplasiæ, and papillomata in the larynx and trachea.

It is admitted by John N. Mackenzie that 'the classification of the laryngeal lesions of congenital syphilis with secondary and tertiary will not obtain as in the case of acquired disease'; and in this respect they correspond with what we find in the pharynx, deep destructive forms of ulceration being not infrequently the first indications of specific mischief in either region.

Age is an important factor both of **etiology** and **prognosis.** Two-thirds of the cases reported occurred within the first year of life; and as to the issue, the younger the patient the more certainly and rapidly fatal is the malady. *Diagnosis* must generally depend on correct recognition of *functional symptoms.* The *voice* and *cry* exhibit all grades of phonetic impairment, from slight huskiness to the toneless whisper of absolute aphonia, with a resulting chronic and permanent hoarseness. *Cough* is frequent, raucous, and paroxysmal, and is unaccompanied by much expectoration. *Respiration* is seriously embarrassed, and *deglutition* is often difficult, and may be painful. *Laryngismus* is noted by John N. Mackenzie as a not infrequent result of congenital syphilitic laryngitis. These symptoms may to some extent be caused by pharyngeal mischief; and there may also be concurrent cutaneous manifestations. Laryngoscopic examination should always be attempted, and is not seldom successfully effected by the expert, even in the very youngest children.

In any case exhibiting the symptoms thus most cursorily sketched, we need not waste time in seeking for confirmation of our diagnosis by attempts to elicit corroborative evidence from the parents, but should at once attempt a treatment which will be happily efficient if the case is syphilitic, and is at least harmless if that dyscrasia is wanting. Local mercurial inunction over the larynx, grey powder in small and frequent doses, and, where the symptoms are acute, vigorous administration, even to iodism, of the iodide of potassium or sodium, are the measures on which we must rely. If the naso-pharyngeal region is obstructed, nasal douches of boracic acid solution, and the passage of a brush charged with menthol through the inferior meatus, will often greatly relieve respiration. When there is evidence of a blocking of the naso-pharynx with adenoids, the dyscrasia should be no hindrance to surgical treatment, constitutional measures being

concurrently pursued. On the other hand, restoration of a free nasal and naso-pharyngeal passage may give such prompt and complete relief to respiratory distress, that, as in the case of diphtheria, the more serious procedure of opening the trachea may not be required. But should all our efforts not be attended by prompt and sensible benefit, I fully agree with John N. Mackenzie that early *tracheotomy*—that is, within forty-eight hours from the first onset—is to be advocated. It is probable that *intubation* would be attended by success in this class of cases.

Whenever infantile laryngitis occurs in a syphilitic subject, recurrence is to be apprehended on very slight aggravating causes. All measures of *prophylaxis* as to exposure to damp and cold must therefore be rigorously enforced for the first seven or eight years of life, and constitutional medical treatment be systematically pursued for an equally lengthened period.

CHAPTER XXIII

TUBERCULOUS LARYNGITIS

(*Open out* PLATES X., XI., XII. *at end of the Book, during perusal of this Chapter*)

SYNONYMS.—Laryngeal phthisis; throat consumption.

'That evidence of the tubercular diathesis influences a local laryngeal inflammation in a manner eminently characteristic, and at a period long prior to the discovery of equally well-marked symptoms in the lungs, is a fact which the daily observation of those engaged in laryngeal practice establishes as incontrovertible. Whether or not there be tubercle actually developed in the larynx, or what indeed is the nature of tubercle wherever developed, the author does not presume, and indeed does not care, to decide. Seeing, however, that tuberculosis is a disease primarily manifesting itself more especially in the respiratory organs, seeing that catarrh is one of the most frequent excitants to that disease, and that many catarrhal inflammations of the lungs commence in the larynx, it is at least fair to infer that, in those cases in which the eye reveals what has come to be recognised as tuberculous laryngitis before the ear detects the presence of tubercle in the lungs, the disease has primarily attacked the former organ. Not only so, but noting also that the morbid changes in the larynx, as physically evidenced in every stage, are quite different from those of simple catarrhal and of syphilitic, to say nothing of exanthematous and other phlegmonous, inflammations, it is not unreasonable to suggest that the factors are also of an equally distinctive character.

'It is quite certain that the pale opaque tumefaction of the arytenoid cartilages and of the epiglottis in laryngeal phthisis has not the clear transparency of serous œdema, the active glandular inflammation of simple laryngitis, the hyperplastic infiltration of syphilis, or the angry inflammatory irritation of carcinoma. Nor is the consequent ulcerative process less distinctive; there is no

erosion, nor deep excavated circumscribed ulcers, followed by narrowing cicatrices; nor new formations taking on an ulcerative process; but a true carious degeneration, causing loss of tissue, which, commencing superficially at small points, leads to universal destruction of the deeper parts, without extension to neighbouring glands, and with but feeble, if any, attempt, under treatment, at a reparative process.

'It is therefore surprising that we should be told, with reference to laryngeal phthisis, on the one hand, that "tubercle appears to play a very secondary part, if any part at all," in its production (Mackenzie); and, on the other, "that neither the catarrh nor the ulceration of phthisical subjects presents any characteristic signs by which it could be recognised as such, [and that] the attempts made to establish pathognomonic peculiarities cannot be said to have succeeded" (Von Ziemssen).

'We prefer to adopt the view of Virchow, who just exactly recommends the larynx as the most appropriate place for the study of true tubercle.'

The foregoing words, with which I commenced this chapter in my first edition, were written twenty years ago. Three years later (1881), in conjunction with Dr. Dundas Grant, I reported, amongst others, two cases which illustrated the probability that the throat can be attacked primarily by tubercle. One was entitled 'Tuberculous ulceration of the tongue two years and a half prior to laryngeal or pulmonary manifestations'; the other, 'Tuberculous disease of the gums and fauces nearly three years prior to laryngeal or pulmonary evidences'; but, as was then stated, the fact that there can be tuberculous disease in either pharynx or larynx apart from tubercle in the lungs, could not be definitely settled until an opportunity should arise of dissecting subjects dying with tuberculosis in the throat, without evidences of the same disease in the chest. Since that time this event has occurred. Demme, in 1883, reported the case of a boy, aged four and a half years, who died of tuberculous meningitis; the necropsy showed the presence of laryngeal ulceration *with tubercle bacilli*, the thoracic and abdominal organs being at the same time free from tuberculous disease. Many other cases similar to our own, in which such a condition was suspected, have also been recorded; and it may now be considered as an accepted fact that tuberculous disease may not only attack the larynx primarily, but may even cause death, without the lungs becoming affected.

We may therefore for the future consider tuberculosis of the

larynx as a *primary* disease, to be studied with equal interest from the aspects of pathology, diagnosis, prognosis, and therapeutics. Notwithstanding, I do not for a moment contend that laryngeal phthisis is not generally *sequential*; nor must it be forgotten that in tuberculous patients laryngitis may occur which is non-tuberculous,—that is to say, a form which does not depend upon the presence of tubercle in the larynx,—and such a laryngitis offers little to distinguish it from an ordinary inflammation, except that it is less amenable to treatment.

Beverley Robinson, in an able paper, insists on the *non*-tuberculous and essentially catarrhal character of 'the very large majority, if not all, of the laryngeal conditions which are encountered in pulmonary phthisis, and which have a more or less direct relationship with the march of the disease in the lungs.' In this view he is opposed to most observers on this side of the Atlantic, and to many of his own countrymen; but there is much force in the arguments he adduces in favour of the probably greater frequency of purely catarrhal conditions of the larynx in American subjects of pulmonary tuberculosis. In this connection it is to be remarked that considerable differences exist in the characters of many other laryngeal diseases in different countries. Laryngeal neoplasms, for example, are probably more frequent in France than in England; and my own experience is decidedly in favour of chronic stenosis of the larynx being much rarer in this country than it would appear to be in Austria-Hungary and Poland.

To return to the question under consideration.

A case recently occurred in the hospital practice of my colleague, Dr. Orwin, in which there was extensive tuberculous destruction of the soft palate. On post-mortem examination, the lungs were likewise seen to be profoundly diseased, but, with the exception of *slight* thickening of the epiglottis, the larynx was free from any tuberculous implication.

Gottstein also quotes an instructive example of a very similar character, in illustration of the non-tuberculous nature of intercurrent laryngeal catarrh, during the progress of a case of pulmonary consumption. The patient was a member of his own family, who died of phthisis:

So long as the pulmonary symptoms were slight, he suffered from repeated attacks of obstinate laryngeal catarrh with aphonia. Though the pulmonary disease advanced, the larynx remained unaffected up to the time of death, while a tuberculous otitis and tuberculous ulceration of the septum of the nose, which resulted in perforation, developed.

Tuberculous laryngitis is seen in both the *acute* and *chronic* forms. The first generally follows on exposure to the ordinary

causes of inflammation, and may then be *primary*; the second is always *secondary* to a manifestation of the dyscrasia in other organs.

ETIOLOGY.—The predisposing causes are identical with those which favour active growth of the tubercle bacillus in other situations. There is the invariable element of a low state of vitality, either hereditary or acquired, with a resulting feebleness of recuperative power. Those exposed to catarrhal influences are more liable to have the larynx primarily attacked. We thus find it much more frequent in the male sex than in the female. As a further proof of the importance of this factor, temporary improvement is often found to take place in summer or on favourable change of residence, this result being more constant and pronounced in the laryngeal than in the pulmonary form of the disease. Experience does not seem to prove that excessive functional activity is by any means an invariable predisponent, but there are sufficient cases on record to illustrate the occasional occurrence of such a cause, and we have personal experience of a failure of voice in the person of professional 'voice-users,' as clergymen, teachers, auctioneers, hawkers, railway porters, and sailors, as the forerunner of a local manifestation of tuberculosis in the larynx. The statement that professional singers are less prone to laryngeal phthisis than other classes of the community, though made as if with authority, has yet to be proved. The collection of the statistics necessary to support such a statement is manifestly a matter of great difficulty, and but little value can be attached to a vague impression of the rarity of a disease occurring among a class, the members of which form but a very small proportion of the general community. A similar and equally erroneous statement is often put forward as to the infrequency of phthisis pulmonalis among the Jewish race. On the other hand, any cause for debility of the general system, which leads to the production of the so-called functional or nervous aphonia, is, quite independently of professional use of the voice, a not uncommon premonitor of throat consumption. In such a case no disease in the larynx will be apparent beyond a loss of adductive power in the vocal cords, and some paleness of the mucous membrane, explained by the general condition; while the lungs, although insufficiently expanded, and of somewhat diminished resonance, may be pronounced free from disease. Local treatment of the larynx by stimulating inhalations and by faradisation may in a greater or less degree restore the voice, which is, however, in any case, soon lost again. Tonics, change of air and of scene, are of no avail, and at a period varying from

a few months to perhaps a couple of years, lesions, undoubtedly phthisical, are developed in both throat and chest.

As to the **frequency** of laryngeal tuberculosis, our **hospital statistics** give a proportion of 2 per cent. to all diseases of the throat, and of 11 per cent. to those of the larynx alone. As to its relation to pulmonary disease of the same nature, Heinze in his exhaustive monograph states that among 4486 consecutive autopsies, made at the Pathological Institute of Leipzig, pulmonary phthisis was the cause of death in 1226 instances, and of these 51.3 per cent. had ulcerations in the larynx; later statistics have abundantly confirmed these figures. Heinze says further, and this is of great interest in connection with our present subject, that *ulcerations were never (very rarely) found with tuberculosis of other organs when the lungs were intact.*

That tuberculosis of the larynx may be primary is now generally accepted by laryngologists, and indeed numerous cases have been put upon record by observers whose competence is beyond question. Whether in such cases the infection is a direct surface infection, or whether the bacillus enters the tissues through other channels and attacks the larynx in the first place, because 'catarrh' or other circumstances have weakened the normal resisting power of the organ, is a question open to discussion. There are many clinical considerations which appear to point to the probable truth of the latter suggestion. If this be correct, primary tuberculosis of the larynx is an occurrence exactly analogous to tuberculous manifestations in the bones, joints, and central nervous system, where so frequently no evidence exists as to the exact spot utilised by the bacilli as an entrance to the system. Thoma has recently published a parallel case, in which, though the presence of the tubercle bacillus was demonstrated in the suprarenal bodies,—the case was one of Addison's disease,—the most minute search failed to reveal the slightest trace of tuberculosis in any other organ.

As to the influence of *sex* and *age* in laryngeal tuberculosis, Heinze's statistics agree in general with those of Willigk, Ziemssen, and others; the proportion of males to females attacked by the disease is as near as possible as three to two; whilst the maximum frequency exists in individuals between twenty-one and thirty years of age; the minimum in those under one year.

Considerable discussion has taken place at various times as to a possible relationship between *nasal disease* and tuberculosis in the lower portions of the respiratory tract. The popular view, and it has been upheld by some medical writers, is that nasal

catarrh and nasal obstruction do predispose to pulmonary tuberculosis. The statistics recently collected by Fletcher Ingals, however, are quite opposed to this conclusion, and may, indeed, be arrayed in favour of the proposition that nasal catarrh to some extent protects from pulmonary disease. Without giving assent to this rather extraordinary view, I am certainly and strongly of opinion that there is no proof that either nasal disease or nasal obstruction is a factor of any importance in the etiology of pulmonary tuberculosis. Were it so, one would expect the resultant mouth breathing to be more often responsible for tuberculous manifestations in the fauces, pharynx, and larynx than we know to be the case.

PATHOLOGY.—**Microscopic Features.**—In discussing tuberculous changes occurring in the larynx, although they are similar to those due to tubercle in other organs, it is necessary to distinguish (1) simple local inflammatory processes, due to indirect and distant influences, from (2) changes due to the actual presence of 'tubercles.'

1. The histological details of simple inflammatory and œdematous changes consist chiefly of dilatation of the small blood vessels and lymph channels, together with a tendency to multiplication and vacuolation of the leucocytes, lymphocytes, and wandering connective-tissue cells, with distension of the intercellular spaces—œdema.

These changes vary in degree according to the severity and duration of the symptoms, from a slight œdema and increased vascularity to well-marked small-cell infiltration, terminating sometimes in resolution, sometimes in fibrosis, rarely in ulceration. Experience, however, teaches that either condition may frequently but does not necessarily precede the deposit of tubercle. Unless ulceration occurs, bacilli are rarely found *in situ*.

2. The tuberculous or nodular changes associated with, or independent of, similar changes in other organs, show a marked tendency to select at first those regions in which lymphoid tissue is most abundant; consequently the ventricular bands are generally the earliest seats of actual nodular deposit, although other regions may laryngoscopically appear to be much more severely attacked. The interlobular tissue of the acino-tubular glands is also very liable to early selection.

The nodules (grey) are at first discrete, but later may fuse, forming agminated masses, and giving the naked-eye appearance of exceptionally large 'tubercles.' They are first found in the subepithelial and submucous tissues, whence they spread by in-

filtration both superficially and deeply. Each consists of a central mass of large epithelioid cells, generally enclosing one or more 'giant' cells, the whole embedded in a dense zone of granulation tissue, in its turn surrounded by loose irregular small-cell or infiltration tissue, which appears to precede the spread of the tubercle itself. Thus three zones may be arbitrarily defined, but, owing to the tubercles being cut in different planes, the several zones may not, under the microscope, always be apparent, and many tubercles may appear to be without giant cells.

Tubercles are non-vascular, and the rare presence of a blood vessel is due to its having become accidentally involved and not to its having been developed with the tubercle.

Giant cells vary somewhat in their characters. There are, however, two distinct types,—one in which the nuclei are regularly arranged in the peripheral part of the hyaline mass, whilst in the other they are more or less central and grouped irregularly. Both kinds occur in tuberculosis, although Thoma states that the first variety is specially characteristic of lupus (*vide* Fig. CCLXIII., p. 617). It must be noted that slow inflammatory changes involving gland ducts may cause histolytic changes in the pre-existing gland or duct epithelium, which give rise to cell masses similar to, if not identical with, giant cells.

As to the origin of the giant cells, definite histological evidence is wanting; but whether they result from the fusion of phagocytes, or endothelial plates, they are very constant and prominent features in the early stage of tubercle, lupus, syphilis, and other inflammatory processes. The larger size of the epithelioid cells and the oval shape of the nuclei distinguish them from the granulation cells. In both, mitotic changes in the nuclei are very marked. The so-called reticulum of the tubercle occasionally found, is probably due to the action of hardening and staining reagents upon the matrix, and is not a definite structure.

By a process of multiplication in either leucocytes, lymphocytes, epithelioid plates, or wandering connective-tissue cells, the peripheral and surrounding zones of the tubercle extend, whilst the tubercle itself either caseates (yellow tuberculosis), undergoes necrosis, or becomes fibrotic. Fig. CCXLIV. is a section through a ventricular band in an advanced stage of tuberculosis. The transformed stratified epithelium is invaded by the infiltration tissue, but has not yet formed an ulcer. Several nodules are seen with giant cells, and an abundance of small-cell or infiltration tissue in several places investing gland ducts. The deeper connective tissue shows marked œdema.

Tuberculous changes, as a rule, spread by the lymph paths, but extension may also occur through the blood-vascular system, as in acute miliary tuberculosis, in which the perivascular spaces become the seat of small grey miliary tubercles, and the exudation is much greater than when associated with lymphatic distribution.

FIG. CCXLIV.—SECTION OF TUBERCULOUS VENTRICULAR BAND (½ *in. Obj.*).

In these circumstances the blood vessels become involved in the infiltration, but as breaking down chiefly occurs in the nodules which are non-vascular, hæmorrhage is unlikely. This is still further prevented by an obliteration process, due to either endothelial multiplication or thrombosis.

As before mentioned, acino-tubular gland tissue is peculiarly prone to tuberculous deposit, a point well illustrated in the early and frequent involvement of the inter-arytenoid fold and epiglottis, where glands are plentiful. Eventually, however, all the laryngeal elements—the perichondrium and even the cartilages themselves, as well as the non-glandular and lowly vascular vocal cords—are attacked; but the interior of the crico-arytenoid articulation generally escapes any actual deposit.

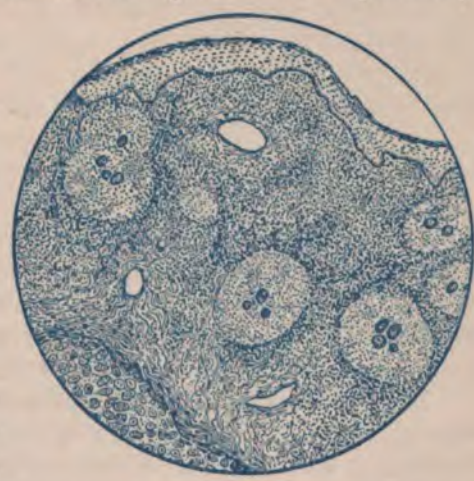


FIG. CCXLV.—TUBERCULOSIS OF EPIGLOTTIS (½ *in. Obj.*).

Tuberculous invasion of an epiglottic is illustrated by Fig. CCXLV., in which several nodules are shown in the stage of

complete development, whilst caseation is indicated by a cloudy appearance of these nodules and resistance to staining.

Bacteriological Features.—However divided opinions may be respecting the micro-organisms of other specific diseases, there is no longer any doubt whatever of the existence and specific nature of a *bacillus tuberculosis*, the ever-memorable discovery by Koch in 1882 having been since confirmed by all bacteriologists.

The characteristic bacilli, easily demonstrated *in situ* by Gram's method of staining, less readily so by the Ziehl-Neelsen process (see formulæ), are to be found most frequently in the new nodules, and occur both inside as well as outside the cells, and not grouped in the well-defined masses which are peculiar to leprosy. During early caseation they are perhaps more prominent, owing to their greater selective activity to staining. Fig. CCXLVI. represents a section stained by the Ziehl-Neelsen method.

FIG. CCXLVI.—A GIANT CELL OF TUBERCLE SHOWING BACILLI *in situ* ($\frac{1}{12}$ *in. oil imm.*)

The individual bacillus is a slender, slightly bent rod, 2 to 4 μ in length. It presents colourless non-staining spots which are probably spores. The organism can be cultivated on blood serum and on glycerine agar, in about fourteen days at a temperature of 37.5 C. The colonies appear as dry, white, scaly patches about 2 to 3 mm. in diameter.

DIAGNOSIS.—The tuberculous process, as witnessed in the larynx, is characterised by—(1) Anæmia, (2) infiltration and tumefaction, (3) ulceration, (4) necrosis or caries, (5) new formations.

1. **Anæmia.**—I was formerly inclined to look on 'a very decided and general pallor of the larynx,' to quote the words of Sawyer, as a much more constant indication of early local changes than I have with further experience found to be the case, for there are undoubtedly a considerable number of instances in

which the disease begins with a hyperæmia. The explanation of these apparently contradictory conditions is afforded by Cohen, who says: 'The earliest recognisable stage of the *acute* form is almost always manifested by marked *congestion* of the mucous membrane. The earliest recognisable stage of the *chronic* and much more frequent form is almost always manifested by marked *pallor* of the mucous membrane.'

2. **Infiltration and Tumefaction.**—This may be considered the first invariable characteristic of laryngeal tuberculosis. It may be general, but is, in the early stages, often but partial. The general seat of earliest infiltration is the inter-arytenoid space, the coverings of one or both of the arytenoid cartilages and the ary-epiglottic folds; but I have often seen swelling of the epiglottis itself precede any other recognisable local change, while in patients whose profession involves much exercise of the voice this indication may first be witnessed on the vocal cords and ventricular bands. The tumefaction is by no means always caused by transient œdema, although it presents many characters thereof, for it may be due to actual tuberculous infiltration of the mucosa. Nevertheless, as Gougenheim has pointed out, this tumefaction, which to all appearance is so considerable and so persistent during life, diminishes notably after death. And this fact has led to much misconception as to its nature. Attention may be usefully drawn to the fact that when perichondritis and caries take place in the course of a laryngeal tuberculosis, the swelling is permanent. This circumstance is, however, one of comparative rarity, and is less likely to lead to suffocative stenosis than is the case with the œdema of other forms of laryngitis.

Fränkel has shown that tuberculous infiltration may extend to the laryngeal muscles. Heinze, however, doubts its frequency, having only found the condition twice in fifty cases. The laryngeal paralyses, especially of adduction, that are sometimes seen in laryngeal tuberculosis, may be due to this cause, but are more frequently explained by a simple mechanical impediment to movement of the crico-arytenoid articulation, as the result of a general infiltration of the joint. Neither true anchylosis nor luxation of this articulation is of common occurrence in laryngeal phthisis. In frequent instances the paralyses are the expression of general weakness, the expiratory force being insufficient to produce due vibration of the cords. In other cases a more or less temporary paresis may be induced by intercurrent catarrhal inflammation. Unilateral abductive laryngeal paralysis in phthisis is more frequent on the right than the left side, and may

then be due to compression of the right recurrent nerve by pleuritic adhesions, or consolidation at the apex. The same nerve may become involved in enlarged bronchial glands on either or both sides. And lastly, abductive paralysis, either uni- or bi-lateral, may, equally with loss of adductive power, be due to disease of the muscles themselves.

3. **Ulcerations** of laryngeal phthisis are characterised by their small size, multiple character, and their tendency to coalesce and to extend laterally rather than to penetrate deeply. I cannot say that I have seen much variation in their shape in different situations, as recorded by Cohen, except that on the vocal cords they have a less carious, mouse-nibbled appearance than is the case in other situations. As before mentioned, erosions, non-tuberculous in character, may appear in the larynx of a tuberculous patient, the subject of a fortuitous catarrh. Doubtless some of those that heal under treatment are of this nature.

Concerning the *character* of the laryngeal ulcer, Heinze's observations were based on fifty autopsies from amongst those who died with pulmonary phthisis during the year 1876 at the Jacob Hospital; and the only basis for a choice of cases was that the throat should be in some manner abnormal. Of this number forty-nine presented ulcerative processes in the larynx, and one an intense catarrh without ulceration. Heinze further discovered that of these forty-nine cases, the ulceration was tuberculous in 83 per cent., and in 17 per cent. non-tuberculous. It will thus be seen that, according to this painstaking observer, the great majority of laryngeal ulcerations in phthisical patients are of tuberculous character. Heinze, moreover, affirms that whenever tubercle could not be found, the loss of substance amounted to merely an erosion of the mucous membrane similar in character to the *aphthous*, or, as Virchow has called it, the *lenticular* ulcer, which has been observed not only in association with tuberculous ulcers, but also as a simple condition in phthisical individuals and in the throat affections of the various exanthemata.

John N. Mackenzie, in allusion to these so-called *aphthous erosions* of the older writers, describes them as *diphtheritic ulcerations* occurring in laryngeal phthisis. They are most common in the trachea, but 'are met with less frequently in the larynx and pharynx. In the former they select the laryngeal aspect of the epiglottis, the anterior surface of the arytenoid cartilages, and the inter-arytenoid fold, as their favourite seats. In the pharynx he has seen them most frequently in the pyriform sinuses, where they sometimes assume a considerable size. Their occurrence here is most probably explained by the accumulation in these cavities of irritant sputa.' This author believes that their anatomical appearances, which he describes with his usual care and minuteness, 'leave no room for doubt that these ulcerated areas are the result of a circumscribed superficial diphtheritic inflammation of the mucous membrane; that is to say, an infiltration of its

tissues with so rich and rapid cell-proliferation as to eventuate in necrosis and sloughing of the superficial layers.'

While fully agreeing with the accuracy of this observation, as well as with the details of the description, I cannot forbear an expression of opinion that the use of the word *diphtheritic* in this connection is unfortunately misleading, and much less happy than the old term *aphthous*, or the more modern one of *corrosive*, or *infective*. If a change were desirable, the words *membranous* or *fibrinous* would accurately and without risk of confusion describe the condition referred to.

4. **Necrosis and caries** may attack any of the cartilages of the larynx, and are probably much more common than is generally supposed; for, on the authority of Heinze, though extrusion of portions of the cartilages is not of very frequent occurrence during life, evidences of necrotic or carious changes are rarely absent on autopsy. Reference to the post-mortem appearances displayed in Figs. 104, 105, and 108, PLATES XI. and XII., sufficiently attest the accuracy of this statement.

Beverley Robinson, in the article already referred to, denies the frequency of abscess in relation to the perichondrial changes in laryngeal phthisis, with which view I entirely agree; but I am bound, as the result of an extended experience derived from post-mortem examinations, to differ as completely from his view that 'the instances are rare indeed in which the cartilages in this disease become either carious or necrosed.' I believe the exact converse to be the fact, at least as we see the disease in this country.

5. **New growths** (Fig. 92, PLATE X.), in connection with tuberculous laryngitis, may occur in all portions of the larynx, and are of the nature of—

(1) *Granular hyperplasiæ*, or *granulomata*. According to John N. Mackenzie, to whom we are again indebted for a systematised description of these tuberculous tumours, the variety under notice is 'anatomically allied to granulation tissue, and may be regarded as representative of a corrective process—*as a natural step towards cicatrisation*.' It must be noted, however, that, unlike simple granulation tissue, tuberculous granulomata contain giant cells.

(2) *Papillomatoid* or *wart-like excrescences* are of less frequent occurrence. They are generally to be found on the posterior laryngeal wall, and Stoerk maintains that their presence in the inter-arytenoid fold is an infallible sign of incipient tuberculosis; Mandl also attached considerable diagnostic importance to their presence: I think, however, that they are quite as often seen in connection with syphilis, or even in chronic laryngitis independently of any specific dyscrasia. In all there are distinct

histological characters which differentiate them from each other, and from true papillomata.

(3) *Solitary tumours* of the windpipe, which are truly *tuberculous* in character, were also first described by John N. Mackenzie, who writes that "such tumours doubtless have a similar origin to the so-called 'metastases' in the laryngeal mucous membrane, which take their departure from old tuberculous disease of other organs, as the kidney (Köhnhorn) and bronchial glands (Lennox Browne)."

Growths of a similar nature also occur in the larynx itself, and have been described by Hajek, Pauzer, Clifford Beale, and others.

The post-mortem appearances of a larynx affected with laryngeal tuberculosis cannot perhaps be better given than by description of what was seen in three typical cases already reported by Dundas Grant and myself; I have depicted the appearances in two of them in Figs. 104 and 105, PLATE XI., and in Fig. 108, PLATE XII. It will be seen that almost every condition to which I have referred as occurring during life is verified in one or other of the examples.

The first specimen (CASE C.) was taken from the body of a man, æt. 36, who was admitted into the Central Throat and Ear Hospital under my care in September 1878. He had suffered with winter cough and hoarseness for three and a half years; dysphagia, and almost complete loss of voice, for two and a half years.

In life his larynx presented the following features (Figs. 106 and 107, PLATE XII.): Mucous membrane very pale; epiglottis apparently normal; around both arytenoids there was considerable swelling, more marked on the left side; the surface of the inter-arytenoid fold, the left ventricular band, and left vocal cord, were covered by an irregularly connected granular ulceration. The adductive power of the left cord was greatly impeded by the mechanical obstruction of the swollen arytenoid cartilage.

The *autopsy* revealed very advanced disease in the lungs, and the following laryngeal changes (Fig. 108, PLATE XII.):—

The mucous membrane generally was exceedingly pale. Epiglottis normal in size and form, but presenting on its laryngeal surface several small follicular elevations. There was much irregular thickening of the ary-epiglottic folds, and the mucous membrane over them was loose and baggy. Over both cornicula and arytenoids the mucous membrane presented a tuberculated appearance, the elevations being of a greyish colour, and of the size of pin-heads. The right ventricular band contained in its posterior two-thirds a dense material of almost cartilaginous consistency, and extending from above the vocal process forward. The left ventricular band was almost completely removed, and covered by a weak-looking ulcer, with irregular elevated margins, and a rough but slightly elevated granular floor, the anterior half of the base of the ulcer being densely indurated. There was great thickening of both vocal cords, notably of the middle third of the left one.

On the inner aspect of the right arytenoid cartilage there was a curious excavation, and the vocal process was ossified, bare, and rough. The joint presented a slight degree

of eburnation. The upper portion of the left arytenoid cartilage down to the level of the vocal process was converted into a rough calcareous nodule about the size of a small pea. It lay loosely in the surrounding soft tissues, and rested on the lower part of the cartilage, which was rough, gritty, of a brown colour, and only held in position by the vocal cords, the joints being completely disorganised, and the articular surfaces quite carious.

Examining the cricoid cartilage, there was found on the right side of its summit, internal to the crico-arytenoid joint, a portion so hardened as to resemble more than anything the structure of dentine, with a cavity in it of the size of a millet-seed, and very suggestive of that of a carious tooth.

The cartilages were all in a prematurely advanced state of ossification.

Under the microscope, a vertical section through the left cord and the ulcer on the left ventricular band, showed that all the structures were infiltrated by a quantity of small round cells, the grouping of which bore unmistakable resemblance to recognised types of tubercular material, albeit that giant cells forming the centres of the groups of leucocytes could not be distinctly made out.

In a second case (CI.), a male, æt. 29, treated in April 1880, in whom laryngeal manifestations were also developed after evidence had been afforded of pulmonary phthisis—

Post-mortem examination showed the following state of matters. Of the epiglottis only the lowest fifth remained as a mere stump, with a very irregular eroded margin. The tissues over the arytenoid cartilages were much increased in bulk. The vocal processes were eroded and bare, each lying in the centre of an ulcer.

A pale, shallow ulcer, with well-defined margin, extended over the whole of the inner wall of the larynx, from the edges of the ary-epiglottic folds down to the mucous membrane of the trachea. The floor of this ulcer had a peculiar worm-eaten appearance, and was thickly beset with small elevations like grains of semolina. These, when picked away, consisted of a yellow, crumbly, and gritty tuberculosis-looking matter, leaving behind small apertures, apparently the mouths of gland ducts, since the material under the microscope was seen to consist of epithelial and pus cells in all stages of fatty degeneration. The ventricular bands were much thickened, almost obscuring the ventricles. The vocal cords were in a similar condition; the cartilages were mobile, and apparently healthy.

Microscopical examination of a section through the anterior part of the ulcer on the left side of the larynx revealed the presence of tubercular infiltration, as evidenced by the existence of a fine cell-material, arranged in masses in which giant cells could be recognised.

The third example (CASE CII.) differs from the preceding, inasmuch as tuberculous ulceration of the tongue had occurred two and a half years prior to either laryngeal or pulmonary manifestations. The patient was a male, æt. 48 years, admitted into hospital in January 1879, with a history clear of suspicion of syphilis.

On local examinations during life the objective signs were:

(*a*) *Tongue* (Fig. 102, PLATE XI.) pale, flabby, indented, and on it two pale, shallow ulcers, with small grain-like elevations on their floors, and having slightly raised irregular margins. Of these ulcers one was situated on the under surface of the left side, near the lip; the other on the right side, about midway in its length.

(*b*) In the larynx, as seen with the mirror (Fig. 101, PLATE XI.), there was observed congestion of the epiglottis, with ulceration on its laryngeal surface, especially toward the right side. Over the right arytenoid cartilage the tissues were so swollen as to form a

large pyriform tumour, concealing the greater portion of the right vocal cord. The left presented the same condition in a minor degree. The right ventricular band was much swollen. The whole larynx was bathed in a mucous fluid.

On *post-mortem* inspection (death occurring two months after admission), the advanced disease in the lungs, and the presence of scrofulous abscesses in the epididymes, etc., testified to the nature of his constitutional disease.

The ulcers on the *tongue* (Fig. 103, PLATE XI.) were changed, in so far as their edges had become pale and sodden-looking, and, the muscular fibres being laid bare, their floors presented a raw-meat appearance; all trace of the grain-like elevations had disappeared.

In the *larynx* (Figs. 104 and 105, PLATE XI.) the mucous membrane generally was pale. The epiglottis was much thickened, and on its free border, from a short distance to the left of the middle line down to the right ary-epiglottic fold, was an excavated ulcer, with rough irregular edges, and a pale, granular base. This ulcer extended over the greater portion of the right half of the laryngeal surface of the epiglottis, and down to the right ventricular band. There were also two other smaller ulcers of less depth, and somewhat oval in shape, on the left half and middle of the epiglottis respectively. The right ary-epiglottic fold was swollen out into a flabby, wrinkled, somewhat globular tumour. The left formed a less prominent swelling. Of the ventricular bands, the right was represented by a firm longitudinal swelling, concealing the ventricle. It was irregular in outline, of a soft, semi-cartilaginous consistency, and quite movable on the subjacent cartilages. The left was normal. The right vocal cord bore on its posterior part, corresponding to the inner surface of the arytenoid cartilage, an ulcer extending into the adjacent part of the ventricle, and containing on its floor a portion of the arytenoid cartilage, which had become bare and rough. The left vocal cord was comparatively healthy.

The *microscopical* appearance in this case was that of tuberculous infiltration of all the tissues involved.

SYMPTOMS: A. **Functional.—Voice.**—Failure of the voice is a very early and frequent symptom. As already remarked, this may be due either to local lesion or to insufficient thoracic power. The voice may be entirely lost at quite an early stage; but more commonly the degree of its impairment is proportionate to the amount of the structural changes in the larynx. The ordinary vocal symptoms which accompany congestion, thickening, or ulceration, already described at length when considering other forms of laryngitis, are also witnessed.

The following is an instance of loss of voice depending on presumably tuberculous changes in the larnyx in an early stage of pulmonary phthisis:

FIG. CCXLVII.

CASE CIII.—G. T. M., æt. 21, residing at Cardiff, and in training for a schoolmaster, came under my care on August 30, 1886, on account of loss of voice, without any other symptom of cough, night sweats, or emaciation. The patient spoke with distinct hoarseness, which was worse after reading and towards the end of the day. With the *laryngoscope* (Fig. CCXLVII.), it was seen that there was congestion, with weakness of adduction of both vocal cords, and that the right one was thickened with surface ulcerations. *Auscultation* demonstrated a small area of dulness at the left base, with increased vocal fremitus, absence of breath sounds, and occasional rhonchus on forcible inspiration.

On questioning him, it was elicited that he had several severe 'colds' on the chest, with pneumonia of the left side, two years ago. A very unfavourable prognosis was given, and on inquiry (March 1887) I learned that the patient, as anticipated, had been obliged to abandon his vocation, and that in the past severe winter his voice and general health had both continued to deteriorate. He died towards the end of that year.

There is a peculiarity in the voice of consumptives with laryngeal mischief not generally described: this is found in the rapidity with which the voice changes in character during a quite short conversation, from a gruff hoarseness to a high falsetto, which as quickly passes into a toneless whisper. These changes are probably influenced by lodgment and dislodgment of secretion, and also by peripheral nerve-irritation affecting the tension of the cords. A somewhat similar, though to the practised ear distinct condition, is occasionally noticed in patients with laryngeal growths, variation in the situation of which produces quick alterations in voice. In both diseases there sometimes occurs a true *diphonia* or double voice, the cause being, in the one under consideration, either the lodgment of mucus between the vocal cords during speech—an occurrence not of course peculiar to phthisis—or alternately by a paresis. In the case of a growth in the larynx, it is the mechanical interference of the neoplasm itself which causes this peculiarity.

Respiration, although short and somewhat frequent, is not, as a rule, embarrassed in the early stage, but as tumefaction leads to mechanical loss of mobility, and the vocal cords themselves become thickened and ulcerated, extreme dyspnœa independently of pulmonary changes, with stridor and paroxysmal aggravations, may ensue. Suffocation, due to stenosis, whether it be due to the semi-solid infiltration of tubercle, or to the more rarely witnessed true œdema which may result from perichondrial and chondrial changes, is less marked in laryngeal phthisis than is the case in either syphilis or cancer.

Cough is naturally a prominent and, on many accounts, a very distressing symptom in the advanced stages, whether it be caused by local or pulmonary lesions, since the mechanical irritation in the larynx produces most acute pain, and the paroxysms of cough are followed by extreme prostration. At a very early period the feeling of a desire to clear the throat of a foreign body predisposes to a worrying, unproductive cough.

Sputa.—Expectoration is not copious, nor more than glairy in character, until suppuration is established. Of course, if with the laryngeal there is also pulmonary phthisis, the sputa will have the features usually found in that condition. Hæmorrhages from

ining the deposit with the microscope for fibres of yellow elastic tissue. Sometimes such fibres may be detected at a period prior to the existence of definite evidences of pulmonary phthisis. Their presence in the sputa, by showing the existence of destructive changes in the pulmonary tissue, will be presumptive evidence that any co-existent laryngeal lesions are probably also tuberculous.

There has been since the time of Louis considerable speculation and much discussion as to the *infective power* of the sputa of patients with phthisical cavities in their lungs to produce laryngeal manifestations; and since the discovery of the tubercle bacillus, the affirmative of this proposition has obtained renewed favour. It cannot, however, in my judgment, be maintained—first, because daily clinical experience gives proof that not only tuberculous ulcerations but the tubercle bacilli are to be found in both pharynx and larynx with almost negative or at least only incipient pulmonary symptoms; and, secondly, because laryngeal evidences are often absent in cases in which there are extensive cavities in the lungs. Moreover, tuberculous infiltration, which is one of the earliest, and an invariable manifestation of the disease, may proceed to even an extreme stage without there being any breach of surface.

Deglutition.—Difficulty of swallowing is by no means an invariable accompaniment of laryngeal phthisis, but when present is, without doubt, the symptom which most tends to hurry on the fatal termination. It is also the symptom for which patients most frequently seek relief of the throat specialist. The trouble, at least in early stages, is mainly mechanical, from impediment to the mobility of the epiglottis and its folds, causing fluids to pass sometimes forwards into the larynx, at others upwards through the naso-pharynx. **Dysphagia** is first experienced only in taking fluids, but as soon as there is ulceration, and when extreme swelling of the arytenoid cartilages, or disease of the cricoid, exists, attempts at the deglutition of solids, unless these are first artificially masticated and made bland, cause the act to be acutely painful. As a rule, food of soft consistence and moderately warm is that most easily taken.

This symptom of **pain** during the act of swallowing is of great diagnostic value when there is the least idea that the disease may be syphilitic, in which condition there may be difficulty, but seldom—and certainly much less—suffering. When, however, the parts can be kept at rest from cough, or when the patient is not eating, it is surprising how little local pain is felt in phthisis;

the larynx, common enough in cancer and syphilis, are but rare in tubercle, even in cases of advanced necrosis, and it is not easy, though the laryngeal origin of the hæmoptysis is suspected, to verify the suspicion. Occasionally, however, the spot at which the vessel has given way can be seen with the laryngoscope.

In one of my cases (CIV.) (*vide* Fig. 90, PLATE X.), a recent clot was observed on the vocal cord after a very moderate hæmoptysis, and there was but slight corroborative local evidence of laryngeal tuberculosis, nor would the examination of the lungs have been sufficient to justify the grave prognosis suggested by the laryngeal appearance, and, unfortunately, verified by the subsequent history of the case.

The *examination* of the sputa for the **tubercle bacillus** should be included in the investigation of every suspected case of laryngeal phthisis. A negative result, however, is by no means conclusive against the diagnosis. Indeed, the bacillus is rarely found, and its presence hardly to be expected, unless the lesions have advanced so far as to produce an actual breach of surface. On the other hand, it is manifest that when pulmonary phthisis exists, the detection of the specific micro-organisms in the sputa is not in itself a guarantee that any laryngeal changes present are undoubtedly tuberculous in character. Granted then that the bacillus is always present in a case of tuberculosis, it does not necessarily follow that it should be found in the sputa in every instance in which the respiratory tract is involved. The position, in short, remains, as was well defined by Koch so long as sixteen years ago, namely, that 'the evidence of bacilli in the sputum has been considered rather as an interesting point of secondary importance, which, while it makes diagnosis more certain, is often neglected, on the ground that it does not help the patient in any way.' Hunter Mackenzie has also pointed out that the 'prognostic value of the bacillus cannot be determined with accuracy, inasmuch as it may be as abundant in a comparatively slow non-febrile case as it is in a more acute and febrile one.' These conclusions are in exact accordance with the results of the examinations for the bacillus which have for some time been systematically pursued in our hospital practice, in every case in which there has been even a suspicion of the presence of tubercle.

In doubtful cases, and in cases where the pulmonary signs are ambiguous and the bacillus is not found, it may be well to examine the sputa by *Fenwick's method*. This consists in boiling a considerable quantity of the sputa with an equal volume of a solution of caustic potash, allowing the mixture to stand for some hours in a conical-shaped vessel, and then exam-

ining the deposit with the microscope for fibres of yellow elastic tissue. Sometimes such fibres may be detected at a period prior to the existence of definite evidences of pulmonary phthisis. Their presence in the sputa, by showing the existence of destructive changes in the pulmonary tissue, will be presumptive evidence that any co-existent laryngeal lesions are probably also tuberculous.

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here, again, differentiating this disease from carcinoma. In the early stages, moreover, there may be but little pain, and nothing more than a sense of discomfort or of a foreign body. In exceptional cases, considerable disintegration of the tissues will go on without any further disorder of sensation. In some instances there is tenderness of the larynx to external touch, as a quite early event. Where there is perichondritis, the skin and soft tissues covering this region are often swollen and inflamed, and are then intensely sensitive to any external manipulations.

B. **Physical.**—Most of the physical changes have been already alluded to in our remarks on the pathology. It remains to more minutely describe the typical laryngoscopic features.

Colour.—(Figs. 89 to 97, PLATE X.; Fig. 101, PLATE XI.; and Figs. 106 and 107, PLATE XII.) The first evidence in the mirror of laryngeal tuberculosis, as more usually presented, is a paleness of the mucous membrane; and it is something more than an anæmia, for while all parts of the larynx, naturally pink, will assume a muddy and greyish hue, the vocal cords will often be found congested, and many engorged capillary vessels will be seen ramifying on that portion of the mucous membrane considered anæmic. As the stage of tumefaction arrives, the colour, while it does not become less pale, is decidedly more opaque, except on the epiglottis, which, as it becomes thickened, may lose its natural buff hue, and assume a pale rosy tint. The mucous membrane of the larynx, and especially the epiglottis, is exceptionally heightened in colour in the case of an acute tuberculous laryngitis, or as a result of an intercurrent catarrh.

Ulceration, except on the epiglottis and vocal cords, is not preceded by hyperæmia, but when the ulcers are formed there is often a faint red line at their circumference (Figs. 93, 94, and 96, PLATE VIII.). The surface of the vocal cords, where loss of tissue has taken place, is frequently of a greyish white or pale yellow colour, while the rest of the cords is congested (Figs. 91, 96, etc.). The ulceration of a vocal cord is seldom deep; but it may extend to the arytenoid cartilage, and lead to caries and even extrusion of that structure.

Form and texture.—Commonly, the first evidence of change of form in laryngeal tuberculosis to be seen in the mirror is one of thickening due to infiltration of the submucous tissue, and this characterises the second stage of the disease. The part first affected may be one or both vocal cords, which may be thickened along their whole length or irregularly; but much more commonly

the first symptom is evidence of deposit (Fig. CCXLVIII.) in the part synonymously defined as the **inter-arytenoid space,** posterior laryngeal wall, or posterior commissure.

Following this, the well-known and often-described swelling over the arytenoid and capitula cartilages is seen (Fig. CCXLIX.) giving rise to the appearance of two pear-shaped bodies, the larger ends of which meet in the middle line, and tapering off laterally into

FIG. CCXLVIII.

FIG. CCXLIX.

the ary-epiglottic folds, they join the epiglottis. This condition, which occasionally is unilateral, is depicted in the accompanying diagrams (Figs. CCXLIX., CCL., and CCLI.), and also in several of the figures on PLATES X., XI., and XII. at the end of the book.

The epiglottis (Figs. CCLI., CCLII., and CCLIII.) takes on a change which renders it quite as unrecognisable as are the

FIG. CCL.

FIG. CCLI.

infiltrated arytenoids. It becomes so misshapen that no longer is its free edge, superior or inferior surface, or any ligamentous fold, to be distinguished, the whole being swollen into a horse-shoe or turban-like shape, which lies nearly horizontally at the base of the tongue, or is so flexed on itself as to resemble a lateral view of the index-finger in a similar position (Fig. 95, PLATE X., and also Fig. CLX., p. 294).

In many instances of laryngeal tuberculosis there is not

only the infiltration of what may be called the circumferential boundaries of the larynx, but the parts within the vestibule are also infiltrated, and this not alone in a tumefaction of one or both ventricular bands laterally, in a thickening of the vocal cords, or by sub-glottic œdema leading to a narrowing of the lumen of the glottis (Fig. CCLII.), conditions familiar to every expert with the mirror; but there is sometimes witnessed a levelling, as it were, of the horizontal planes of the larynx, so that the swollen ventricular band is almost on a line with the ary-epiglottic fold; the limits of the ventricle itself are obscured, and the loss of definition and contour is such that the relative distances of parts at various levels are almost obscured (Fig. CCLIII.).

Some allusion has been made to the character of the ulcerations. Their peculiarity is their worm-eaten, carious appearance,

FIG. CCLII.

FIG. CCLIII.

showing that degeneration has not commenced at the surface, but in the deeper tissues; or rather, as is probably the case, that the interlobular tissue of the acinous glands has first undergone degeneration; the gland ducts becoming blocked, and subsequently giving way at the surface, being the direction of least resistance. These small ulcers then unite by breaking down the inter-acinous tissue, and so form large necrosing areas (Figs. 94 and 96, PLATE X.). Narrowing of the glottis is often the result of tissue-changes, but there is rarely any attempt at cicatrisation. Paralysis of one or both vocal cords is frequently seen, and may be due either to mechanical impediment or to nerve-pressure.

Mandl was one of the first to draw attention to the fact, illustrated in the figure referred to, that, contrary to experience in other paralyses of the recurrent laryngeal nerve, the right nerve is, in cases of laryngeal phthisis, much more frequently pressed upon than the left. This, as already noted, is usually thought to be explained by the anatomical relation of the right nerve to the apex of the lung, but the subject is one which merits further investigation.

Secretion.—As mentioned when treating of the sputa, the secretion becomes altered in character as the disease advances, from a glairy, viscid exudation of scant or moderate amount, to a copious muco-purulent discharge.

The accompanying sketch (Fig. CCLIV.) not only illustrates the character of tuberculous ulceration, but the manner in which the mucus, when tenacious, forms bridges between the vocal cords. This latter condition is not peculiar to laryngeal phthisis, and is to be witnessed especially in that form of inflammation known as *laryngitis sicca*, p. 464.

FIG. CCLIV.

Whenever there is actual chondrial caries, the odour of the discharge is very characteristic, though fœtor may be also due to pulmonary causes.

C. **Miscellaneous.**—There can be no reason for entering largely into general symptoms, except to remark that increased frequency of the pulse and range of body temperature, as well as evidence of mal-assimilation, giving rise to dyspepsia and loss of weight, are of as great importance in the early stages of laryngeal as of pulmonary or other forms of phthisis. With reference to the state of the lungs, early and frequently repeated auscultation should be made. At first nothing more may be discovered than slightly diminished resonance, hardly perceptible increase of vocal fremitus, with some prolongation of the expiratory murmur; but gradually and surely the pulmonary evidences will become more strongly marked. It must not be forgotten that, though tuberculous disease may be first detected in the larynx, cases must always be rare in which a patient has died of that disease without well-marked symptoms in life, and appearances after death, of pulmonic disintegration. In many instances of deeply situated pulmonary disease, the negative evidences afforded by the stethoscope are apt to colour too favourably one's opinion of laryngeal symptoms.

DIFFERENTIAL DIAGNOSIS.—On the assumption that there is a difficulty in distinguishing tuberculosis in the larynx from syphilis, some writers have seriously and, as I consider, needlessly exercised their minds on the subject. Having nothing to add to the opinion given in 1881 in the article by Dundas Grant and myself, so often previously quoted, our remarks under this heading are repeated here with but slight modification, and with the less hesitation because Bosworth, Beverley Robinson, and other careful observers have since that time specially drawn atten-

tion to them as accurately expressing the opinion of the majority of laryngologists:—

'The symptoms as narrated in the foregoing descriptions are so typical as to enable even those unaccustomed to the use of the laryngoscope to diagnose the condition with tolerable certainty. Briefly, the emaciation and loss of weight, night-sweats, aphonia, cough with profuse laryngorrhœa of semi-purulent character, pain only in deglutition, more marked in the case of fluids, with tenderness on pressure of the larynx, afford an unmistakable picture of the disease in question.

'In *cancer*, besides its more marked cachexia, the disease is distinguished by the constant presence of pain independently of functional acts, as well as its occurrence in deglutition, being more intense in the case of solids than of fluids.

'The distinctions from *syphilis* have been succinctly and accurately considered by Moure. Syphilis gives a hoarse, rather than an aphonic character to the voice; is, on the whole, free from pain, and has other symptoms of its own sufficiently distinctive to afford a reliable guide.

'Anchylosis of the crico-arytenoid articulation, paralysis of laryngeal muscles (as from implication of the nerves supplying them, or following *diphtheria* and other diseases), are unaccompanied by general emaciation, unless in the case of nerve-pressure the paralysis be due to a malignant growth. Thus, in a general way, the symptoms, apart from the physical signs, give a fair clue to the presence of laryngeal phthisis.

'It is, however, only by a recognition of the characteristic appearances as reflected in the laryngoscope that a certain diagnosis can be made. These appearances are the peculiar semi-solid swelling and worm-eaten ulceration of the epiglottis and ary-epiglottic folds, often described by other authors, and well illustrated in the figures accompanying this work. The swelling is often much greater on one side than the other, but we never see tumefaction of the tissues covering one arytenoid cartilage much advanced without a similar condition existing to some extent over the other side also, thus distinguishing it from *cancer* and from *non-tuberculous perichondritis*. We have used the word semi-solid as applied to the swelling, but its resemblance under the light of the laryngoscopic lamp to serous or purulent effusions is often so complete as to mislead even practised observers.

'The ulceration of laryngeal phthisis has been, for what reason we know not, a stumbling-block to many laryngoscopists. Von Ziemssen states: "Neither the catarrh nor the ulceration of

phthisical subjects present any characteristic signs by which it could be recognised as such." This assertion one of us ventured to combat on its first appearance. We, however, find Dr. Vivian Poore telling his students at the London University College that "this is perfectly true, and that his experience enables him to endorse this assertion." Cohen is of much the same opinion, and says "that the aspect of these ulcerations is hardly sufficiently characteristic for differential diagnosis, without reference to the cachexia." Even Morell Mackenzie, whose earlier writings taught differently (see his essays in Reynolds and Aitken), although he describes very minutely and accurately the characteristic differences between the various specific ulcerations to which the larynx is subject, now gives in his adhesion to Heinze, and is of opinion that the latter "very properly declines to accept descriptions of the laryngoscopic appearances of tubercle (by Ter Maten, Türck, and others), remarking that even in the case of a larynx fresh from the body it is impossible to determine absolutely with the naked eye whether the ulceration is tubercular or not."

'Granted, with Mackenzie and Cohen, that in cases in which syphilis attacks phthisical patients,—a verdict by no means so common now as before the recognition of pharyngeal tuberculosis,—the diagnosis may occasionally be difficult, we cannot, in spite of the array of authorities which we have quoted against ourselves, admit the non-existence of a truly characteristic tuberculous ulceration in the larynx. On the contrary, we believe in it most firmly, and we venture to speak boldly on this question from a clinical standpoint, in opposition to the timorous who will not admit tubercle without distinct pulmonary evidence during life or microscopic examination after death. We can only further say that, with the exception of laryngeal growths, we know no disease in which, with the laryngoscope, we can be so sure of our diagnosis, and that, so far from being dependent for confirmation on an examination of the chest, we have in not a few instances diagnosed the disease in the larynx in spite of opinions of eminent auscultators that the chest was sound. To more particularly formularise our views on this important point, we hold that, given the characteristic grey semi-solid infiltration of epiglottis, ary-epiglottic folds, or both—an appearance we consider almost invariably the precursor of ulceration—there is a form of ulcer super-imposed on the swollen tissue which we believe to be distinctly characteristic, and which we are able to foretell is incurable. Even in the absence of the thickening, the character of the ulceration is hardly less typical. It is in itself essentially

one of that class in which there is absence of healing, owing to defect of action. We do not desire to reiterate the description often already detailed, nor can we hope to rival, or to add much to, the graphic truth of the word-picture drawn of tuberculous ulceration by Türck,—many as are the years that have passed since it was written,—but these one or two points we would emphasise. The floor of a *tuberculous* ulcer is pale and granular and slightly depressed, the margins are fairly well marked, but not deeply excavated, the surrounding parts pale and languid, and there is an appearance of a spreading process of erosion very comparable to that caused by the nibbling of a small rodent animal. This is due to the confluence of small ulcers, produced by the slow incurable inflammation of the mucous and closed follicles of the mucous membrane, and also to the ejection of minute tubercles which have worked their way to the surface. Very different from this is the punched-out, areolated excavation which is seen in *tertiary syphilis*, and which may be considered suggestive of a bite rather than of the continued nibbling to which we have likened the tuberculous ulcer. Nor need we insist on the angry, hyperæmic, thickened walls of a *cancerous* ulceration, with its accompanying deformities and other signs, to still further point the laryngoscopic diagnosis.

'We only ask the merest tyro in laryngoscopy to study carefully the wood-cuts of Türck, or even of Cohen and of Mackenzie, to say nothing of our own illustrations,—which are, moreover, typical, not exceptional,—and, having studied them, to decide for himself whether Ziemssen is justified in stating that "the attempts made to establish pathognomonic peculiarities cannot be said to have succeeded."

'So far we have indicated with detail the intrinsic characters of the ulcer *per se* which point to a phthisical condition. As for simple *chronic laryngitis* with ulceration, the rarity of this affection is so great, apart from phthisis, that Heinze reports (setting aside cases of syphilis, cancer, or diphtheria) but 6 per cent. of cases of laryngeal ulceration unaccompanied by tubercle, and these few are further referred to typhoid. Extended examination of neighbouring parts enables us to make as secure a provisional diagnosis as surgery in general admits, and certainly one much more secure than is usually possible in the domain of internal medicine. Thus the condition of the pharynx and palate, be it in the pallid-veined condition of some cases, or in the well-marked state of tubercular ulceration of others, gives an unmistakable clue to the nature of the malady. The absence of

evidence of syphilitic disease in the pharynx, and of the deposit of cancerous material in the neighbouring lymphatic glands, further aid by a process of exclusion to a complete diagnosis.

'The temperature, and the condition of the other organs of the body, afford collateral evidence, to the importance of which we need only allude; but, with regard to the temperature, we have not always found, except in quite early stages, the variations of such extent as is usual in ordinary cases of pulmonary phthisis. This is due, no doubt, to the inanition caused by the odynphagia, which, in its turn, contributes so much to the more rapidly fatal termination of these cases.'

Diagnosis is sometimes difficult in those rare cases—much more rare than formerly—in which the subject of chronic syphilitic laryngitis becomes infected with tubercle.

CASE CV.—The laryngoscopic appearance of one such case is depicted on Fig. 97, PLATE X. In the larynx of the patient from whom this picture was taken, the epiglottis, which had been early attacked, bore all the characteristics of syphilis, while the infiltration of the tissues covering the arytenoids and ventricular bands resembled the changes wrought by tubercle in this region. The patient was under observation for over three years, and only in the last six or eight months was pulmonary disease developed, whilst his epiglottis was actively attacked and yielded to anti-syphilitic remedies when he first applied for treatment.

CASE CVI.—Another case, which occurred in my hospital practice twenty years ago. John K., æt. 45, who was first seen by me at the Hospital in March 1878. He had some eight or ten years previously suffered from syphilis, but had not since been much troubled in his health, until the previous Christmas, when he first experienced irritation in the throat, followed by cough which was accompanied by free expectoration. Soon afterwards he felt difficulty in swallowing, with coincident pain shooting up to his ears; but not much pain at other times. Quite recently he had sweated profusely at night, and he was becoming thinner. There was evidence of advanced apical mischief in both lungs, especially the right. On examination with the laryngoscope, the epiglottis was seen to have been largely destroyed by old ulceration, which was now quiescent. His arytenoids were pale, swollen, and 'worm-eaten' (Fig. CCLV.). At first he seemed to improve under the influence of biniodide and cod-liver oil; but he soon relapsed, and died rather suddenly on July 29th. The autopsy revealed a condition in the larynx similar to that usually seen in tuberculosis, but the surface was generally redder than is common to that disease (Fig. CCLVI.). The trachea was intensely red, and at about the ninth ring it was perforated by an ulcer which had apparently commenced in the œsophagus.

COURSE, PROGNOSIS, AND TERMINATION.—As already stated in connection with tuberculosis of the pharynx and fauces, the prognosis 'is seldom doubtful,' and we are not justified in giving other than an unfavourable forecast either as to recovery of health or duration of life. Nevertheless, in one case at least—that of a youth about seventeen—I have seen entire arrest of undoubted disease in both larynx and lungs with complete restoration to health, this happy event being brought about

by sea voyages to Australia. In other cases the progress of the disease is sometimes very slow, and may become chronic. This condition arises when the infiltration and ulceration are confined to intra-laryngeal tissues, as the ventricular bands, vocal cords, and laryngeal aspect of the arytenoid cartilages. In such circumstances there is often but little body-wasting, and the principal discomfort may be that of vocal impairment. Doubtless in these cases the laryngitis is not always truly tuberculous, but is of the nature of a recurrent catarrhal inflammation occurring in the subject of pulmonary or other form of phthisis. Where the infiltration is considerable, especially of the ary-epiglottic folds, there is superadded distress due to dyspnœa and laryngeal cough. On the other hand, whenever the epiglottis or the pharyngeal aspect of the larynx is involved, and when perichondrial changes present themselves, the course of the disease rapidly progresses to a fatal issue, and gravely influences the prognosis which the pulmonary symptoms might otherwise indicate. The cause of such a rapidly fatal

FIG. CCLV. — SYPHILO-TUBERCULOUS LARYNGITIS. LARYNGOSCOPIC APPEARANCE.

FIG. CCLVI.—POST-MORTEM APPEARANCE OF LARYNX AND TRACHEA IN THE SAME CASE.

termination may be explained by the circumstance that the odynphagia, by preventing the taking of sufficient nutriment, adds the effects of starvation to those of uncomplicated phthisis; for although cases are not uncommonly reported of patients affected with dysphagia from other causes preserving life for nearly the natural span on spoon-diet, in those we are now considering, the enfeebled system, unable even to sustain itself on a comparatively full diet, is much less capable of counteracting by slops and sops the rapid wasting the disease produces. Whatever the nature and amount of the laryngeal evidences of tubercle, it repeatedly occurs that the laryngoscopist is not only able to give an earlier and more accurate diagnosis, but he may also be forced to give a far more grave forecast, than would be afforded by examination of the chest and by general symptoms alone.

Prognosis as to duration of life is that, with a given degree of pulmonary disease, the rapidity of termination is greater in proportion to the amount of difficulty in swallowing.

Laryngeal phthisis *per se* may cause death—(1) By suffocation, (2) by inanition and general marasmus, and (3) by hæmorrhage. The first may be possibly relieved temporarily by tracheotomy, the second by artificial feeding per rectum or by an œsophageal tube. The last is a rare event as occurring from a point within the larynx.

TREATMENT.—It is not necessary to repeat here the many details of general and local therapeutics, dietetics, and hygiene, which have been so fully discussed in our previous section on pharyngeal tuberculosis. What we have mainly to bear in mind is that when tuberculosis is manifested in the throat and larynx, we have something superadded to a general infection which tends to diminish the chances of a 'cure,' and is indeed likely to expedite a fatal termination.

The indications for **general** treatment in regard to the laryngeal trouble are to alleviate the intensity of the symptoms peculiar to manifestations in that region. First, we should try to diminish the cough, so as to give as complete functional rest as possible, and we should also endeavour to relieve the irritability of the fauces and upper portion of the gullet which so seriously impedes the taking of nutriment. For these purposes bismuth and bromide of potassium, taken shortly before food, will often be found of service.

Among purely medicinal measures which act beneficially on the general infection as well as on the vocal condition, there can be no doubt of the value of guaiacol carbonate and of creasote,

the latter more especially in the form obtained from beech-wood. My practice is to commence with 5 grs. of guaiacol carbonate thrice daily, and to gradually increase the dose until a maximum of 20 grs. is obtained. Creasote I order in perles—1 minim increased to 10 or 15 thrice daily. I have rarely seen digestion disordered by either of these remedies in the doses mentioned. Professor Von Leyden highly recommends creasotal, which is the name given to carbonate of creasote; and Gleitsmann speaks favourably of benzozol. The hypophosphites of sodium and calcium are also useful therapeutic agents, and are well assimilated, especially in the anæmic stage of the disease (Form. 94). A somewhat similar combination, and one which, so far as I have tried it, has proved decidedly satisfactory, is the syrup of the glycerophosphates—of sodium, calcium, and iron. Cod-liver oil I am less enthusiastic about than are many authorities; when administered it is certainly necessary to pay particular attention to the digestive functions, and when not tolerated at other times, it may agree well if taken in a single daily dose at bedtime.

I dismiss from consideration treatment by iodide of potassium —stated by Moritz Schmidt at Milan, in 1880, to be efficacious in curing tuberculous ulcerations of the larynx—since I have found it universally baneful rather than beneficial in undoubted cases of laryngeal phthisis, if uncomplicated by syphilis. Nor need any more be said of another method of treatment, viz. the use of enemata of sulphuretted hydrogen, which held a brief fashion some few years ago.

Of general directions, there is manifestly special need for insisting upon the importance of sparing the voice as much as possible, so as to give rest to the diseased larynx; and the advantages of an atmosphere of uniform temperature and free from dust are equally obvious. The use of tobacco must be kept within narrow limits, and may need to be altogether suspended. As to alcohol, great as is its value in this as in other wasting diseases, it should never be administered unless freely diluted or in some bland medium.

When symptoms of irritation exist in the throat, all food should be of a demulcent character, of soft consistence, and should be taken at a most moderate temperature. It will often be prevented from 'going the wrong way,' when this symptom is troublesome, by directing the patient to thicken his drink, and to gulp instead of sipping it. The raw egg swallowed *en bloc*, as previously described (p. 188), will be found specially agreeable and

appropriate to this disease. Wolfenden has published the following simple method, learned from a patient, of obviating difficulty in swallowing, experienced in those cases in which the epiglottis is thickened and ulcerated. The patient, lying on a couch face downwards, and with the legs elevated, sucks, by means of an india-rubber tube, fluid from a tumbler held in his hand. Many other practitioners besides myself have repeatedly confirmed the advantage of this method.

In reference to **climate**, my experience is uniform, that the rarefied air of elevated plateaux, such as Davōs and other stations on the Upper Engadine, often so beneficial in cases of pulmonary phthisis, is unsuitable to patients suffering from tuberculous manifestations in the larynx, though here I find myself in conflict with such eminent authorities as Solley, Dennison, and Clinton Wagner, in their experience of the somewhat analogous health resorts of Colorado. The laryngeal symptoms appear to be aggravated in such an atmosphere, even though at the same time the pulmonary lesions are improving. That climatic influences constitute a therapeutic agent of distinct efficacy in laryngeal phthisis is, however, undoubted. I have again and again seen cases in which the beneficial effect of such places as Bournemouth, Hastings, and Torquay has been most marked; and it is my practice to advise the removal to one of the health resorts mentioned, of patients who, after local treatment of the larynx, do not make satisfactory progress, or in whom there is displayed a tendency to relapse by residence in London. This is more particularly the case with those who come from the northern parts of Britain, and I have seen the same to be true of patients from New Brunswick and various regions of Canada. But for those whose residence has been in the home or southern counties, it is necessary to seek a still warmer latitude. South Africa and parts of Australia may be tried when British health resorts fail, and I have known cases benefited by emigration to these countries, even to the extent of a practical cure. The Riviera is not to be recommended, in consequence of the frequent prevalence of unfavourable winds, the temptation in a warm sun to forget the necessity for winter clothing, and the many unduly exciting, and consequently exhausting, influences of social fashion. Nor is residence in Egypt altogether favourable for phthisical patients. The atmosphere is often dusty, and suitable accommodation for invalids is difficult to obtain, except in hotels, where the social and festive elements are very apt to interfere with the successful cultivation of repose. Algiers and Tangier are in many respects

circulation in that of anæmia. It is in the anæmic form that deposit in the inter-arytenoid region is most common, with more or less sessile granulomata in that situation; and atomised inhalations of the nature described are useful in preventing this development. Guaiacol is another remedy usefully employed in the form of spray. Its application is usually followed by severe smarting, amounting almost to agony, which, however, after a few seconds, passes off, and is succeeded by a sensation of relief equally exquisite. It is well, therefore, to commence with a comparatively weak solution, say 30 to 50 per cent. in olive oil, and to gradually increase the strength until, if necessary, the undiluted guaiacol itself may be applied (Form. 60). When there is excessive pain, I employ in spray an ethereal solution of aristol —8 to 10 per cent. (Form. 62)—but morphine insufflations I have never advocated, except in hopeless cases, believing this substance so exhibited to have an effect equally pernicious as when administered internally. Neither do I advise the use of cocaine, except as a preliminary to intra-laryngeal curetting, or friction with lactic acid, though it may be advantageously employed in advanced cases for the temporary relief of dysphagia, discontinuing its use on the first evidence of improvement. Cocaine is not, as a rule, well borne by the tuberculous patient, and latterly eucaine has proved an efficient substitute for it, with an absence of most of its disadvantages (Form. 45 and 46). Some authorities report benefit from free spraying of the larynx with a concentrated solution of iodoform in a mixture of alcohol and ether, but my own experience of this treatment is not encouraging. Various germicides have also been used, in the form of atomised inhalations. Of these may be mentioned aniline, as recommended by Kremianski of Moscow, and corrosive sublimate (1 in 5000), as suggested by Reynolds. Regarding the latter remedy, it should be remembered that living cells as well as germs are capable of being destroyed, and that their destruction, indeed, is the easier accomplished in persons of tuberculous tendencies.

Intra-laryngeal insufflations of powders are sometimes employed, but in my judgment all remedies are better applied in solution, and preferably as sprays under high pressure. There is one other form of local treatment of which I may here express my disapproval. It is the practice of surface scarifying, or even deeply incising, the infiltrated laryngeal tissues, as advocated by Schmidt and Rossbach. Such a proceeding is little likely to reduce a swelling which is not due to mere serous exudation, and

nevertheless many general physicians do not quite fully realise to how large an extent success depends on careful attention to detail.

A proper inhaler, generating steam at a temperature accurately registered, according to the special circumstances of the patient and the time of the year, so that, while moist, warm air is inhaled, and the volatile ingredient thrown off, the respiratory muscles are not fatigued nor the circulation quickened, is surely better than a jug of hot water with a napkin lying over the patient's face and covering the jug, as advised by an eminent author; and it is not surprising if by the latter method there is a strong liability to induce enfeebling sweat. Again, when local remedies are applied, they are often worse than useless, unless the mirror guide the hand, and the application be made to the part affected, and to that only.

Of **inhalations**—in the anæmic stage, and when the infiltrative is only commencing, stimulating volatile ingredients, as creasote, the oil of pine, eucalyptus, and other essential oils, in water at a temperature of 130° to 150° F., are of service; but when cough, distress of breathing, and dysphagia, due to narrowing of the larynx, ulceration of the cords or of the epiglottis, occur, all inhalations must be of the most soothing nature.

Plain steam, at from 120° to 140° F.; compound tincture of benzoin, 1 fluid drm. to a pint of water, at a similar temperature, with or without three to five drops of chloroform, for each inhalation; conium (B.P.), or hop—are then to be recommended (Form. 27, 28, and 35). With respect to the last-named remedy, it should be remembered that the oil of hop is very stimulating, not to say irritating; while the extract, with a little carbonate of sodium, as used with the extract of conium, or a fresh infusion, is most soothing. The use of iodine as an inhalant is also to be deprecated, on account of its powerfully irritant properties.

The best method of securing accuracy and thoroughness of topical medication of the larynx, with a minimum of distress to the patient, is by means of **atomised inhalations**, the application being directed by the laryngeal mirror. As employed by the patient himself they are but of little use; they readily cause fatigue, and usually also irritate the abnormally sensitive mucous membrane. Whether in the acute or chronic form, I believe menthol (20 per cent. in paroleine) or menthol (20) combined with iodol (2 per cent. in almond oil), in the form of a spray, gives the best results in the pre-ulcerative stage, by promoting resolution in the case of a local hyperæmia, and by stimulating the capillary

in patients of low recuperative power there is the probability of the supervention of ulceration.

One of the most important methods of applying remedies to the interior of the larynx, the subject of tuberculosis, is by means of the **cotton-wool brush,** which should be so trimmed as to allow firmness of friction. The solutions appropriate to pharyngeal ulcerations are equally appropriate to the laryngeal condition. *Menthol*—20 per cent. in olive oil—is a favourite application (Form. 64). Guaiacol threatens to supersede it, or in any case is a valuable change application (Form. 60). Ruault claims to have had excellent results from painting the larynx with a 20 to 40 per cent. solution of phenol in *sulpho-ricinate of sodium*, and his position is to a considerable extent endorsed by Heryng, Massei, and others. Spengler has advocated *parachlorophenol* mixed with an equal volume of glycerine; and Hedderich, who used, however, only a 10 per cent. solution, has obtained fair results with this agent. Lublinski and Seifert, on the other hand, report adverse experiences, and my own tend in the same direction, or at least to a feebleness of result.

Again, the **intra-laryngeal syringe** may be employed to secure direct medication of the laryngeal, or its extension to the tracheal, mucous membrane. Menthol in olive oil, guaiacol, and various other agents, may be employed in this manner.

In this connection attention may also be drawn to the local **submucous injection** of remedial agents in cases of laryngeal phthisis. Chappell has had extensive and encouraging experience of the use of *creasote*, and has devised a special syringe for its injection. He combines the *creasote* with *menthol* and oil of *winter-green* in solution in castor oil, and employs this both as a spray to the larynx and also for submucous medication. *Pyoktanin* (2 per cent.), europhen, and aristol (2 per cent. in ether) have also been used as sub-mucous injections. I have had good results from both *creasote* and *guaiacol* so administered; and also of intra-tracheal injections of a strength of 1 to 2 per cent. for concurrent treatment of pulmonary disease. The dose I have given has never exceeded one drachm, but Botey recommends a gradual increase to four or five times this quantity.

When **dysphagia** is troublesome, many of the measures recommended in the discussion of tuberculosis of the pharynx are appropriate, and the recommendations already advanced in reference to the preparation of the food and the mode of swallowing should be borne in mind. Lozenges of cocaine, or preferably

eucaine, are useful. They should be of soft consistence, and each may contain $\frac{1}{10}$ gr. of the remedy.

Cough may be relieved by the use of lozenges of opium or morphine. The patient must, of course, be cautioned against the risk of using them too freely. A linctus containing morphia freely diluted so as to be slowly sipped, may often be employed with both advantage and safety. Codeine lozenges also are very useful in diminishing local irritation and checking cough.

There remain now to be considered some more active forms of treatment, which, though of comparatively recent introduction, are found, as experience increases, to rest upon a well-established basis.

With rare exceptions, the combined experience of specialists long inclined to the view that, although a tuberculous ulceration in the throat may, as in other parts, sometimes heal, such a process is certain to be followed sooner or later by an outbreak in close proximity. The disease, as we have seen, may even become chronic and lie dormant, of which state Solis Cohen reports several cases, with praiseworthy narration of the final results. It is many years since I ventured to say that 'not even the most sanguine throat specialist is yet justified in giving even a moderately hopeful opinion as to the result of any known treatment.' That expression was received with general favour, and has more than once been quoted. The question is, are we able to modify that opinion at the present day?

Unfortunately it remains true that in a large proportion of cases of laryngeal phthisis, the course of the disease can at best be but favourably modified or held in check by the use of remedial measures. Even in those cases in which definite improvement can be credited to the interference of the practitioner, there is always the possibility or even the probability of relapse or recurrence, unless by hygienic and other measures a favourable environment for the patient is secured. Still there can be no doubt that there is some justification at the present day for regarding the disease with a less despondent attitude than was formerly the case, and for this improved prognosis we are largely indebted to the work and teaching of Krause and Heryng. In a paper read by Krause before the Laryngological Subsection of the Fifty-ninth Meeting of German Naturalists and Physicians at Berlin, on September 21, 1886, that author asserted that 'ulcers of the posterior laryngeal wall are curable by lactic acid, which he had then been employing for over a year. When there is not too much marasmus, which is a contra-

indication, no tuberculous ulcer can resist cicatrisation by application of *lactic acid*, made by a practised hand. The pain or even a certain amount of spasm resulting from the treatment is no contra-indication.' The success of this measure was confirmed by such eminent authorities as Schroetter and B. Fränkel. Schnitzler, at this meeting, while admitting that laryngeal phthisis is curable, remarked that every new medicament has had its temporary successes, and he believed the employment of *iodoform* after currettement to give better results than lactic acid. The results of my own practice are directly opposed to this; for, with considerable experience, I have seen no benefit whatever from either insufflations of iodoform in powder, or applications of it in solution. Dr. Murray of Washington recommends a new preparation called enzymol as a most valuable auxiliary to the curette and lactic acid. It is non-irritating, and possesses in a high degree the quality of digesting necrosed tissue.

Heryng of Warsaw, a trustworthy and also an original and bold practitioner, read two papers on the same occasion, 'On the Curability of Tuberculous Laryngeal Ulcers, and on their Treatment,' and reported that 'he had seen eight unquestionable cases which prove the curability by curettage of tuberculous ulcers. He had also seen cures of such ulcers without medication. The ulcers were on the true and false ligaments, *pars arytenoidei*, and epiglottis. Their tuberculous nature was assured by the contemporaneous affection of the lung, and the presence of bacilli. In three cases the cure lasted respectively nine, two, and one years; and in five cases half to three years. With the cure of the larynx, the condition of the lung is ameliorated; the voice becomes better, and general improvement results.'

Early in 1887 I exhibited a patient at the Medical Society, treated by the method of Krause, the details of whose treatment in every respect are in accordance with his statements.

FIG. CCLVII.—LARYNGOSCOPIC IMAGE.

It is that of Matilda H., whose history, symptoms, physical evidences in throat and chest, are narrated as Case XIX. at p. 290, and I append a copy of the appearance sketched on her case-paper (Fig. CCLVII.).

It will be observed that the manifestations were in this case in the very situation remarked by Krause as favourable to treatment. Having applied cocaine, I first scraped the parts with a circular curette—in fact, the instrument of Löwenberg, for removal of post-pharyngeal adenomata. I then applied on a cotton-wool brush, and with considerable firmness, a 20 per cent. solution of lactic acid. This was repeated daily, the strength being increased to 40 and ultimately to 60 per cent. At the end of three weeks acute inflam-

mation of the pharynx and larynx took place; but, as asserted by Krause, the pain was no contra-indication to success, for on recovery the parts cicatrised healthily, and not only was the extreme odynphagia which had been experienced on admission completely relieved, but weight was regained, and the pulmonary condition improved. It only remains to add that the patient was still alive and in fair health six years later.

All my colleagues are equally enthusiastic with myself in experiments with these methods, and since the publication of the former edition of this volmme, we have had several cases as strikingly relieved as the one quoted. Moreover, we have seen many in which, after a few days of treatment, emaciation has been arrested, deglutition improved, cough and amount of local secretion diminished, and lastly an actual regain of lost weight. It is also right to add that in every case we urge employment, for at least twelve hours a day, of the oro-nasal inhaler with the inhalants in Form. 39, 48, and 49, or with menthol, and to this measure we attach great importance. I am the more confirmed in this favourable view by the communicated experience of Walker Downie and other British laryngologists.

I am not of opinion that the exact mode in which the application of lactic acid is made to the larynx influences the result; but Bosworth, who for many years has claimed a large proportion of cures, or at least of arrest of the tuberculous process in the larynx, lays great stress on the use of the spray, locally directed by the physician with the aid of the mirror. Personally, I have doubts if by this method the application reaches to the ventricles and deeper parts so completely as by a soft but firm brush of absorbent wool, only moderately charged with the solution. This view has been enforced by Roe. In the use of lactic acid there cannot be a doubt that some amount of distinct friction is necessary, but the application should always be localised to the exact part implicated. Before the solution is employed the ulcer should always be carefully but thoroughly scraped by a curette.

In later communications, Krause claims that 'no opposition worth mentioning against the lactic acid treatment is to be found,' and defends the practice of curettement as applied to the larynx, as similar to the scraping of a tuberculous joint or sinus. Nor is he in favour of extreme carefulness in the choice of cases, believing that in many instances, where cure is quite impossible, the patient's sufferings and pain may be much relieved. In these positions Krause is supported by the extensive experience of Heryng, not to mention other laryngologists. Indeed, it must now be accepted that there are many cases of laryngeal phthisis in which surgical interference in the form of curetting and the removal of unhealthy

tissue, followed by the application of lactic acid, is likely to prove of decided benefit. No doubt such interference must be restricted to those who have acquired the necessary technique and dexterity, but, as the value of surgical measures becomes recognised, the number of those competent to apply them will doubtless increase. Those who desire to pursue the subject in detail cannot do better than refer to the *Proceedings of the International Medical Congress at Rome* (1894), and to the *Transactions of the British Laryngological, Rhinological, and Otological Association* (1895), where important communications from Krause, Heryng, Gleitsmann and others, are printed *in extenso*. I have here figured some of the curettes employed in cases of laryngeal phthisis. Those of Krause, it will be observed, are constructed on the

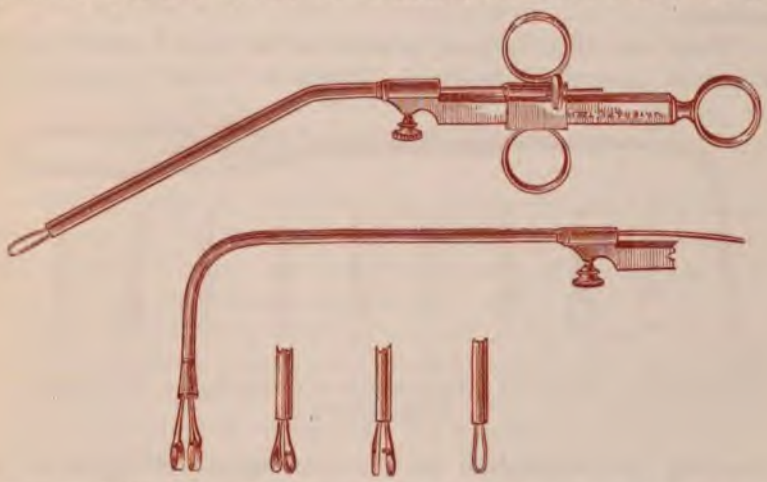


FIG. CCLVIII.—KRAUSE'S INSTRUMENTS FOR CURETTEMENT IN LARYNGEAL TUBERCULOSIS.

principle of Morell Mackenzie's tube forceps, while Heryng's curettes (on next page) are more of the nature of knives. Heryng has lately introduced a 'rotary double curette' which offers advantages in facility and thoroughness.

Gleitsmann, though convinced of the value of curettement, gave expression in London in 1895 to the general opinion of the laryngologists of the United States as in favour, on the whole, of somewhat milder measures, and in this he is supported by Delavan. It is, indeed, the position occupied probably by a majority of English-speaking laryngologists. In a more recent paper Gleitsmann expresses his approval of Krause's recommendation of 'curettage as a measure of relief in advanced phthisis

when the dysphagia is so severe as to prevent the patient from taking nourishment.' But the cases must, I think, be rare in which the treatment would be justified by the result.

Of the use of electrolysis or 'cupric interstitial cataphoresis,' as recommended by Scheppegrell of New Orleans, Gleitsmann, Capart of Brussels, and others, I have no personal experience; but, looking to the exceedingly intolerant condition of the mucous membrane, a procedure which involves the retaining of a copper electrode within the larynx for a period of from three to eight minutes appears to me hardly likely to be sufficiently practicable as to promise permanence of adoption. The employment of the galvano-cautery below the level of the epiglottis, as suggested by Gleitsmann, can scarcely be catalogued as a 'mild measure.'

There are other surgical procedures advocated which appear to me to pass the bounds of discretion. Thus Gougnenheim,

FIG. CCLIX.—HERYNG'S INSTRUMENTS FOR CURETTEMENT IN LARYNGEAL TUBERCULOSIS.

regarding the infiltration in the inter-arytenoid region as an evidence of local perichondritis or necrosis, proceeds to extirpate the arytenoid cartilages by a form of laryngeal punch forceps. I am the less disposed to attempt to emulate his dexterity, that I am unable to agree with his premisses; nor, if there were certain evidence of disease of the cartilages, should I be inclined to consider the case as one still open to surgical interference. Removal of the epiglottis, when extensively affected by the disease, is, however, often justified by the results, and is the less serious now that it is generally admitted that the organ does not take the important part in deglutition formerly attributed to it by physiologists.

Neither the operation of **thyrotomy**—which has at least one advocate—nor that of **extirpation of the larynx** can be considered a rational procedure in dealing with such a disease as laryngeal phthisis.

Tracheotomy.—In my former editions I have spoken very unfavourably of this operation on patients who are the subjects of laryngeal phthisis, and I am not now prepared to admit that it is advisable, except in rare instances, and to relieve extreme symptoms of a suffocative character; for it should be borne in mind that in this disease the whole mucous membrane is most sensitive to irritation, and is strongly disposed to ulceration, and that the cartilages of the larynx and trachea are, if not actually degenerated, most prone, with the least aggravation, to caries. It is therefore extremely doubtful whether the presence of a tracheotomy-tube does not, in such a case, actually increase the embarrassment of both respiration and deglutition. At the most, with one or two rare exceptions reported by Hofmann and Lohoff, the operation can but prolong life a few days or weeks, with but little, if any, amelioration of distressing symptoms; while in one direction, as pointed out by Percy Kidd, physical distress is distinctly increased, the presence of the tracheotomy-tube making the act of coughing much more difficult, and sometimes even impossible.

Laryngotomy, as counselled by Pieniazek, when the lesions are localised in the region of the glottis, is still less to be recommended, on account of the liability for caries of the cricoid to be set up by irritation of the cannula.

Early tracheotomy has been advised, on the twofold plea that, when the disease is primary, tracheotomy diminishes the liability to pulmonary infection, and that, functional rest being afforded to the larynx, topical medication has a better chance of success. Curiously enough, it has to be added that one of the strongest advocates of tracheotomy in laryngeal phthisis, Beverley Robinson of New York, has also maintained that a laryngitis occurring in the course of a pulmonary phthisis is not necessarily, nor indeed frequently, of itself tuberculous, but is to all intents and purposes of the essence of an ordinary catarrh. Answering the first of these pleas, the probability of the tuberculous disease being primary in the larynx, I have to say that, though I for many years believed in the possibility of a primary tuberculosis of the larynx, before it was actually demonstrated as a fact, I cannot agree that such a circumstance is other than rare in medical experience. And as to the second, I am not at all prepared to admit that absolute rest of the larynx is likely to follow a tracheotomy on a tuberculous patient, whatever the stage; on the contrary, in no disease is a tube so ill borne or so liable to set up increased inflammatory irritation and ulceration. Moreover, in

no disease is there greater probability of the untoward risk of what we may call collapse of the larynx—a not infrequent result of tracheotomy—which, first noted by Liston, has since been insisted on by Whistler. Nor is it true that the larynx can be more effectively treated by topical measures after tracheotomy than before, for, on account of the disposition to collapse just mentioned, the larynx is almost invariably far more difficult to examine, as also to be treated internally, after a tracheotomy-tube has been introduced.

Tracheotomy is advocated by Schmidt, on the ground that it not only betters respiration, but also that it deviates from the larynx the passage of irritating air; to which it has only to be replied that, by use of oro-nasal inhalers and suitable atmospheres, the air to the larynx can readily be made non-irritating, and even remedial, when inspired through the natural passages, and this to a greater extent than can be provided for in the air which goes to the lungs through a tracheotomy-tube.

But the operation is also performed by Schmidt, by Heryng, and by Gouguenheim and Tissier, not only where the laryngeal disease is marked and advancing, but also in cases in which the lungs are admittedly affected. The last-named joint authors, in a recently published treatise, hold that even extensive disease of the lungs does not contra-indicate the operation, if the temperature be not high, and digestion be good; to which condition I cannot assent, for a comparatively low temperature in laryngeal phthisis is by no means a favourable indication, whilst good digestion is a circumstance hardly ever likely to be afforded us as a factor for consideration in this disease, and certainly not in advanced cases.

I must therefore, with all respect to the many able laryngologists who advocate tracheotomy in tuberculous laryngitis, offer my uncompromising opposition thereto, hardly excepting cases of urgent dyspnœa, in which it is considered as permissible by Solis-Cohen, Morell Mackenzie, and Krishaber. I certainly would not perform it, even in such an emergency, except at the request of the patient or his friends, and not even then without very plainly stating that, although death by actual suffocation might be thereby averted, life would hardly be prolonged, and that only at some considerable expense of suffering and lingering distress. We ought also to bear in mind that performance of tracheotomy in a case of advanced tuberculous disease is likely to bring both the operation and the surgeon who performs it into disrepute; for as

to the operation, an unfavourable result in one case may militate against consent being given to its performance in another, where chances of permanent relief might be good; and as to the operator, particularly if a specialist, he is liable to the imputation of having disregarded every consideration beyond the narrow area of his special province.

CHAPTER XXIV

LUPUS OF THE MOUTH, PHARYNX, AND LARYNX

(Fig. 51, PLATE VI.)

[It has been thought convenient to treat all these conditions under one heading; and, in view of the greater importance of the laryngeal manifestations, discussion of those in the other regions of the throat has been postponed, from the position they should properly occupy according to the plan of this volume.]

AT the time of writing my first edition I had not seen a case of lupus in the throat, and at the date of its publication there were only nine cases on record, of which at least three were doubtful. Just, however, at that period Lefferts contributed an important essay on this, as it was then considered, rare disease, with a carefully recorded case which had occurred in his own practice. He it was who first suggested that lupus of the throat would be found to be much less rare than had hitherto been supposed, if it were looked for in all subjects presenting cutaneous manifestations. Until then only patients who complained of laryngeal symptoms were inspected with the laryngoscope in the Skin Clinic of Vienna, and of the whole number thus examined the proportion that afforded evidence of lupus in the larynx was only 8 per cent.; but laryngoscopic observation by Chiari and Riehl of every patient with lupus showed that the larynx was affected in as many as six cases out of sixty—10 per cent. Holm of Copenhagen found disease in the larynx in six cases out of ninety with the general disease. These combined investigations give a proportion of about 8 per cent. of laryngeal manifestations in 150 patients suffering from lupus of other parts of the body; and the figures agree closely with my own experience.

Through the kindness of Drs. Harries and Campbell, I had an opportunity, in the summer of 1886, of examining the throats of twenty-five patients suffering from lupus, who were at that time attending St. John's Hospital for Diseases of the Skin. I found laryngeal changes in three cases; in one of these there was also

ulceration of the velum. But I discovered palatal evidences in three others; so that one-fifth of the cases, or 20 per cent., were the subject of either faucial or laryngeal manifestations, while the latter only were present in 12 per cent.; practically the same proportion as was observed by Chiari and Riehl. Strange to say, though the voice was more or less hoarse, thick, or nasal in every one, in not a single instance was there complaint of difficulty in either deglutition or respiration. This circumstance illustrates an important diagnostic element of the disease, namely, that the functional symptoms are as a rule very slight even in the presence of long-standing structural changes. In addition to the foregoing cases, to all of which more detailed allusion will be presently made and their throat appearances portrayed, I had seen (in 1887) three other cases with laryngeal manifestations, and one with solely palatal changes; I had also had the opportunity of studying a fifth under the care of my colleague, Dr. Orwin. Thus, in twenty years (1866–86) of special throat practice, I saw fewer laryngeal, and still fewer palatal, cases of lupus than at a skin hospital in a few weeks.

Lefferts goes so far as to affirm that 'he would not accept the diagnosis of lupus of the larynx or pharynx, unless accompanied by lupus of the face.' Without doubt such an association is the rule, but quite a number of cases have been recorded in which the laryngeal disease has preceded the cutaneous. Some of them are admittedly equivocal, notably the well-known one of Von Ziemssen, but others are quite beyond question. Such a one is that reported by Morris Asch of New York, who, in an able essay on the disease, full of interesting bibliographical history, reports—

> The patient was a young girl, æt. 18, suffering from ulceration, believed to be true lupus, occurring simultaneously in the larynx and pharynx; also there was already on the posterior wall of the pharynx a large radiating cicatrix, of the origin of which the patient could give no history. . . . Examination of the surface of the body discovered no cutaneous lesion, eruption, or enlarged glands, and the closest enquiry failed to reveal any antecedent syphilitic history, inherited or otherwise. The patient was a tall, slender blonde, of the type with which we are accustomed to associate strumous disease. The condition of the teeth is not noted.

Lefferts, in discussion, expressed his opinion that this case was one of inherited syphilis, and undoubtedly, in the absence of cutaneous corroboration, the diagnosis is not easy; but the following case is in every respect very similar, with the exception that confirmation of this character did not occur *till six years after the throat affection.*

The observation is inserted by the kind permission of Dr. Orwin, whose patient she was.

CASE CVII.—Maggie N., a fair girl, æt. 21, from Northampton, first attended at the Central Throat and Ear Hospital on September 11th, 1886. She gave the following history :—When 11 years old, had bronchitis with ulcerated throat; and was then ill for six months. Since that period she has had fairly good health, but has always been conscious of a slight wheezing sound in her breathing. She did not apply on account of her throat, as 'she reckoned that well,' but for the disease of her nose (Fig. CCLX.), which presented all the characters of, and was at once diagnosed as, *lupus vulgaris*.

FIG. CCLX.—LUPUS OF THE NOSE AND UPPER GUMS.

By reference to the illustration, it will be noticed that the disease had also attacked the coverings of the alveolar processes of the upper jaw. The gums were almost eaten away, and as a consequence the upper teeth had an abnormally long and projecting appearance; otherwise they were well formed and free from any characteristics of syphilis or scrofula. The gums had been first affected *more than four years previously*, and the erosion was stated to have been very gradual. The disease of the nostril *commenced some months later*, and the patches on the cheek still more recently. The family history was good, and the general health and nutrition of the patient were excellent.

The **voice** of this patient was but slightly modified in phonetic quality; articulation nearly perfect, perhaps a little altered by the condition of the teeth and gums, and sometimes a trifle nasal in character. The **respiration** was slightly wheezing; the sound being

FIG. CCLXI.—CONDITION OF THE PHARYNX.

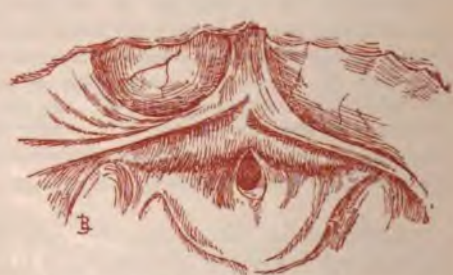


FIG. CCLXII.—CONDITION OF THE LARYNX.

laryngeal during inspiration, and nasal during expiration. There had never been any dyspnœa or increase of stridor, and she could run up and down stairs without distress.

There was no **cough**; **deglutition** quite normal, and no disorder in the senses of **hearing, smell**, or **taste**.

On examination of the pharynx (Fig. CCLXI.), it was seen that the whole of the uvula and a portion of the soft palate and of the pillars of the fauces had been destroyed, and there was a stellate scar above the situation of the uvula. The hard palate had been untouched by disease. The posterior wall of the pharynx was somewhat more granular than normal, and certainly more so than in tertiary syphilis.

The laryngoscope showed a very peculiar condition (Fig. CCLXII.). The whole mucous membrane was markedly pale, and of an opaque warm greyish tone. There was no sign of any active inflammation, and on touching the surface sensibility was found to be diminished. The epiglottis was almost entirely destroyed, being represented by several tight cicatricial bands, which were, so to speak, hypertrophied substitutes for the ordinary epiglottic ligamentous attachments to the tongue and pharynx. The under surface or cushion was continuous in plane with the ventricular bands, which in turn were merged into the ary-epiglottic folds.

In the centre of the laryngoscopic field was observed a small opening not large enough to admit an instrument of the size of a goose-quill. This orifice was evidently on a level superior to the vocal cords, which, from the tone of the voice, appeared to be quite unaffected. There was no hypertrophy of the papillæ at the base of the tongue.

The patient was exhibited by Dr. Orwin at the Medical Society of London, in November 1886, when she was seen by many specialists, who agreed in the diagnosis of lupus; but had it not been for the cutaneous evidence, which was only afforded six years after the ulceration in the throat, there can be no doubt that this case would have been set down as one of syphilis, or at least as one of *scrofulous lupus*, described by Homolle, and acknowledged as a separate variety by Lefferts. I see, however, no useful object to be gained by the adoption of such a subdivision.

Knight of Boston has recorded three cases:—

The first has many points of striking similarity to the foregoing, but the throat was affected subsequently to the face.

In the second, the patient—a married female, 36 years old—had scarlatina at 8 years of age, serious throat trouble of the nature of lupus at 25, and ulceration of the skin of the nose at 28, 'after ulceration of the throat.' In speaking of this case in discussion, the author had no doubt that it 'was a genuine one of lupus, and the lesions upon the skin confirmed this view; certainly the manifestations appeared too late to be considered as due to congenital syphilis, and acquired disease was out of the question.

The only element of doubt arises from the existence of necrosis of the hard palate—a circumstance incompatible with the generally admitted view that, whilst the ulceration of lupus may extend to muscles, tendon, and cartilage, it stops short at bone. Knight's third case is one which he believes to have been lupus of the pharynx, without manifestation elsewhere.

Consideration of all the foregoing cases, as well as of others of a similar character, reported by competent observers, and especially of that of No. CVII., must force us to the conclusion

that lupus may exist in the throat without external manifestations, or long prior to the same; and that, though such a circumstance is undoubtedly exceptional, it is just one of those exceptions to rule which, as Sir James Paget has so wisely said, may be in fact but the beginning of a new law.

ETIOLOGY.—Lupus has been generally considered by English and French dermatologists as evidence of a scrofulous taint—a term which is, for the most part, very loosely applied. Without doubt it is often merely a euphemism for syphilis, and is indeed so employed by Erasmus Wilson in connection with this very disease. Others—Pye Smith, for example—think that 'the whole process is strikingly similar to that which occurs in the lungs during the course of phthisis.'

I think everyone will admit that the general characters of lupus are more nearly allied to those of tubercle than of syphilis, though the absence of general constitutional disturbance and of failure of nutrition separate it clinically from the majority of cases of tuberculous disease, whilst the administration of mercury, so beneficial a proceeding in syphilis, has in lupus a decidedly prejudicial effect. German authorities, while repelling the scrofulous theory, offer nothing better as an etiological substitute. Gottstein expresses the general opinion that 'the causes of laryngeal lupus are similar to those influencing the disease in other parts, or, in other words, often unknown.'

Harries and Campbell, in a joint contribution of high clinical value, thus summarise their views:—

'In order that this disease may develop, there will be needed—

'(*a*) *A Suitable Soil*, the exact characters of which we are as yet unable to define; and though possibly allied to tuberculosis and scrofula, is yet not identical with either.

'(*b*) *A Predisposing Cause.*—Traumatism, at some period perhaps remote, being the most important.

'(*c*) *An Exciting Cause.*—Probably a micro-organism.'

As to the first of these factors, there is nothing more to be said. In reference to traumatism, Virchow has defined scrofula as 'vulnerability,' by which he means a tendency to react on slight injuries, and difficulty in recovering from them; and undoubtedly this influence is very frequent in lupus. In one, that of J. V. (No. CXIV.), to be presently described, injuries were the cause not only of the first manifestation on the face, but of several later ulcerations in remote portions of the body.

What is the immediate cause of lupus in the throat it is difficult to say. In one of Knight's cases, scarlatina is suggested. In

others it may be due to auto-inoculability, which is an undoubted feature of lupus. Whether in these cases there is a slight scratch or abrasion on the gums or soft palate in the first instance, or whether it be due to the transplantation on a wounded or unwounded surface of a micro-organism, I do not presume to decide. Campbell, in the 'Essays' referred to, has discussed this question at great length and with impartiality. While admitting that the micro-organisms are possibly pathogenic, he is forced to allow that, 'so far as we can gather from the works quoted, lupus bacilli have only been observed in cases where ulceration, actual or incipient, existed. Nevertheless,' he continues, 'we may be justified in stating that lupus, whether ulcerating or not, is probably coincident with the presence of bacilli in the diseased tissue.' It may be further remarked that, while some investigators—Koch, for example, and also Neisser—contend that the bacillus of lupus is identical with that of tuberculosis, others, including Kaposi, Schwimmer, and Campbell, affirm that there is no such similarity or identity.

Lupus of the throat, as of the skin, is more common in females than in males; Chiari and Riehl, Ramon de la Sota, Marty and myself, all agree in this conclusion. As a rule, the disease is more often seen in the lower than in the upper classes of society.

An exception to this rule was seen in the first instance of lupus in the larynx which occurred in my own practice. The CASE (No. CVIII.) was that of a lady, aged about 48, who was sent to me in November 1879 by Dr. Poyet of Paris, on account of lupus in the larynx, which was manifested in the form of considerable hyperæmia and nodulation of the epiglottis, and ulceration of the right ary-epiglottic fold. She was the subject of four or five patches on various parts of the body, one on the neck just under the right angle of the jaw, for which she was concurrently treated by Mr. Jonathan Hutchinson. The disease had existed for about three years, and no cause could be ascertained for its origin. The patient was considered to be of a gouty-rheumatic diathesis, and had twice undergone a 'cure' at Aix-les-Bains for sciatica. She was above average height, well nourished, and the mother of two healthy and exceptionally handsome daughters. The husband was also tall and strong, and was most positive in his denial of any venereal history.

It is worthy of remark that while under treatment this lady fell downstairs and cut her face. The wound, which required sutures, healed well and quickly.

The disease is said to be most commonly manifested in youth. The ages of the eleven patients seen by me up to 1887 were respectively 21, 48, 43, 46, 20, 17, 8, 24, 23, 16, and 19. In twenty-three cases observed by Homolle, eighteen occurred before the age of 20. His observations are in accordance with those of Hebra regarding the general malady, but are contravened by Ramon de la Sota in connection with the region now under

consideration, he distinctly saying that he has seen lupus in the throat in adults oftener than in children. This author does not believe that 'any local agencies whatever are to be considered as especially prone to produce the disease.'

Finally, it may be mentioned that, with one exception, all the patients I have seen with lupus in the throat have been persons of fair complexion, with light or light-brown hair, and with blue or grey eyes; in fact, with features recognised as typical of the lymphatic temperament.

PATHOLOGY.—This has been discussed to some extent under Etiology, and there is nothing specially distinctive in the characters, either macro- or micro-scopical, of the disease in the throat. The surface appearances will be best given under the head of objective or physical signs, and I need only express my agreement with Lefferts that the first essential pathological element is hypertrophy of tissue—a hyperplasia and infiltration that change to a marked degree the normal configuration of the part. The second element is the ulceration, which is always slow, is very destructive, but much more gradual and less actively inflammatory than syphilis, when it attacks the soft palate, while in the larynx it partakes of the worm-eaten character of phthisis. The resulting cicatrix is exceedingly hard and unyielding; it is accompanied by hyperplasia that tends to form contracting bands and to constrictions rather than to the formation of outgrowths. A pathological feature of distinction is the occasional occurrence of fresh granulations on cicatrised tissue which is apparently passive. In the mouth the disease is evidenced by much granulation on the gums.

Chiari and Riehl describe laryngeal lupus as beginning with development of single papillary growths, varying in prominence and size (from a millet to a hemp-seed), as is the case in other mucous membranes; these either remain single or appear in crowded groups on the slightly hyperæmic mucous membrane. The groups increase either in the neighbourhood of, or on the parts first affected, both in extent and prominence, so that at one time is seen a flat, not very prominent, and glandular-looking thickening of the mucosa, while in other cases there are produced nodular and prominent swellings. Like its congeners, lupus is characterised by the appearance and extrusion of small cell infiltration tissue, which spreads mainly by the lymphatic channels involving adjacent structures. At certain points nodules are formed containing 'giant' cells, in which the nuclei are arranged at the periphery of the mass.

Fig. CCLXIII. represents a section taken from the lymphoid tissue of a ventricular band attacked by lupus. The reticulum is well shown, owing to the majority of the small cells having fallen out.

The histological details of lupus are more like leprosy than true tubercle. The chief points of interest are—

1. The micro-organisms are of doubtful existence.
2. The granulations are vascular.
3. It spreads along the lymphatics.

When the small cell tissues involve the superficial layer of the dermis, the Malpighian cells become active, as shown by accentuated karyo-kinesis and vacuolation, followed by desquamation of the horny layer, or by softening and necrosis. Generally sclerosis follows without caseation, ulceration, or any solution in continuity of the surface. Should ulceration occur, red granulations are found covered with pus.

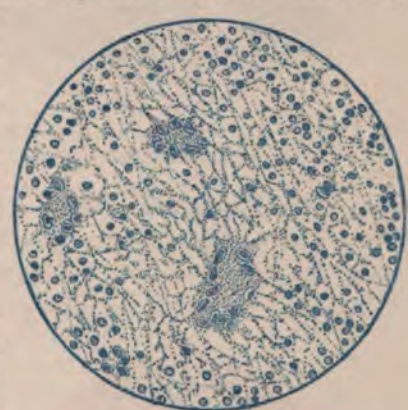


FIG. CCLXIII.—SECTION THROUGH A LUPOUS NODULE (⅛ *in. Obj.*).

The giant cells follow the development of small cell tissue. According to Baumgarten, they are derived from fixed connective-tissue cells, while Gaule and Arnoldt maintain that they originate in pre-existing epithelium. The character of their nuclei is strongly suggestive that they belong to the epithelioid or endothelial group of cells lining blood or lymph channels.

Since the foregoing general description of the morbid anatomy of lupus was written, a case has come under our notice (No. CXX. p. 629) in which the free removal of nodules has afforded material for a more exhaustive microscopical analysis of the changes incidental to the disease in this region.

In the first place, it must be recorded that out of 500 sections, prepared from this case alone, Mr. Wingrave failed to identify a single bacillus characteristic of a tuberculous process.

Mr. St. George Reid, our hospital bacteriologist, who amplified this investigation, failed also, and reported as follows:—

'The organisms found were principally micrococci, not scattered irregularly through the tissue, but collected in small zoogloea masses, by an arrangement suggestive of that

occurring with the bacillus of leprosy. The grouping of the organisms recalls also the description given by Vignal and Mallasez of their researches on the micro-organisms of zooglœa tuberculosis in the lower animals.'

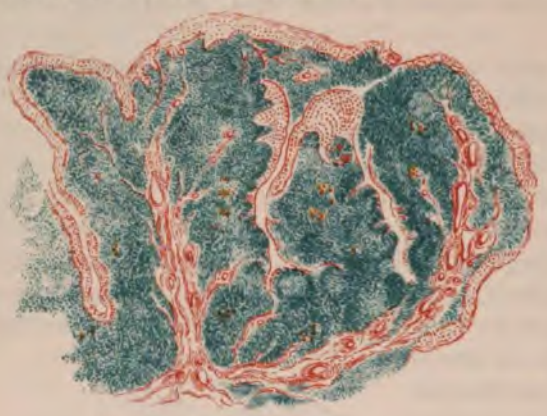


FIG. CCLXIV.—LUPUS OF LINGUAL TONSIL (½ *in. Obj.*). EHRLICH-BIONDI STAIN.

Reverting to the morbid anatomy, Fig. CCLXIV. represents a section of lingual tonsil, an exceptionally rare situation for the disease. The small cell tissue of lupus has invaded the lymphoid nodules, and involved the epithelial lining of the lacunæ; a process more fully illustrated in Fig. CCLXV., where, under a higher power, active epithelial changes are visible. The normal stratification is invaded by infiltration tissue, resulting in complete destruction of the surface cells, which exhibit considerable tendency to nest formation. Hyaloid bodies, so characteristic of chronic inflammations, are plentiful. In Fig. CCLXIV. we also see early manifestations of interstitial fibrosis, whilst well-defined nodules of lupus elements, containing giant cells, are irregularly distributed. These nodules are to be distinguished from the normal follicles by the larger size of the cell elements, and by the irregularity of their distribution and shape.

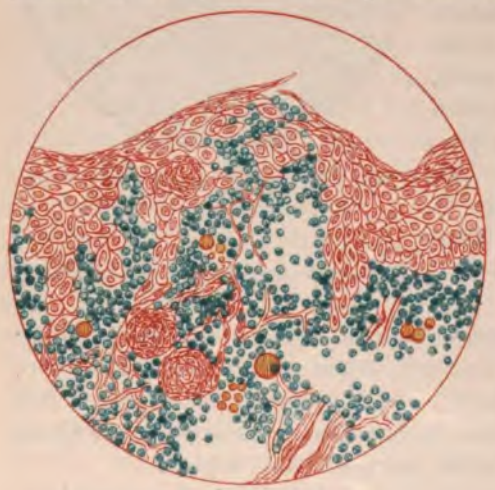


FIG. CCLXV.—LUPUS OF LINGUAL TONSIL (⅛ *in. Obj.*). EHRLICH-BIONDI STAIN.

In Fig. CCLXVI., representing a section of the epiglottis taken from the same patient, we find a still more pronounced illustration of the fibrotic changes. The bands of sclerotic tissue specially select the red stain, whilst the more recent small cell tissue takes the green. The perichondrium is seen to share in the general sclerosis. Lastly, Fig. CCLXVII. illustrates a giant cell surrounded by reticulum, entangling inflammatory corpuscles and hyaline spheres. The stratified epithelium indicates that the section was taken from the surface.

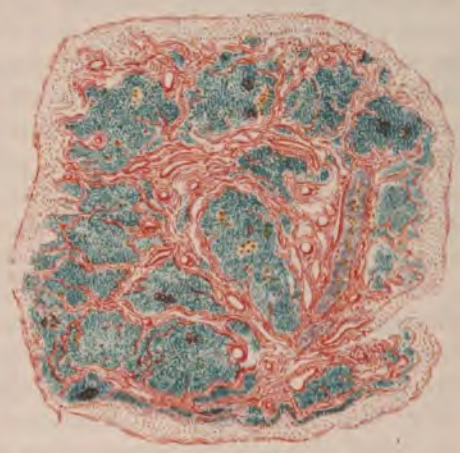


FIG. CCLXVI.—LUPUS OF THE EPIGLOTTIS (½ *in. Obj.*). EHRLICH-BIONDI STAIN.

I cannot agree with Gottstein that the infiltration is often absorbed. The reduction in swelling which takes place may produce apparent absorption, but this is at the cost of indurating and stenosing cicatricial contractions.

With the exception of the epiglottis, which is the part most frequently attacked, the cartilages of the larynx seldom undergo inflammation or degeneration. Gottstein, however, mentions the fact that exfoliation of the arytenoid cartilage was once observed by Eppinger, and partial destruction of the thyroid cartilage by Idelson.

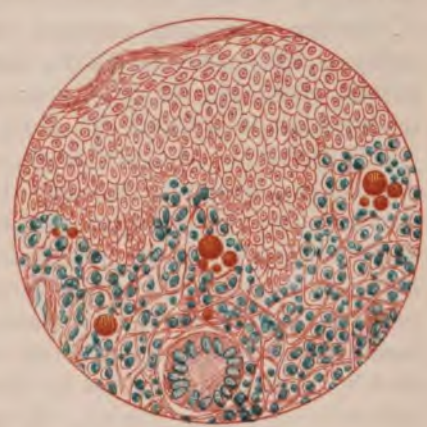


FIG. CCLXVII.—LUPUS OF THE EPIGLOTTIS (⅛ *in. Obj.*). EHRLICH-BIONDI STAIN.

It is of great interest to endeavour to trace what is the connection between lupus and tubercle. As has been already remarked, there are an equal number of eminent observers arrayed both for and against the view that the bacillus of the two diseases

is identical; and clinical evidence would appear to show that there is a decided similarity between the two affections. Neisser is of opinion that 'qualitatively (probably) the bacilli are the same, only quantitatively there is a difference, which is intensified by the less favourable nutritive conditions in the cooler skin.' But there are many reasons for supposing that the distinction between the two is not one simply of quantity; for lupus is very little, if at all, more rapid in its progress when it attacks the mucous membranes than when it is manifested in the 'cooler' skin; and, moreover, from the vital point of view, tuberculosis is much more universally and rapidly fatal to life than lupus. The probable truth, then, is that, though perhaps not morphologically distinguishable from that of tubercle, the microbe of lupus is the less powerfully infective both locally and constitutionally, or, as Marty tersely puts it, lupus is an 'attenuated tuberculosis.' The view that the lesions of lupus are essentially tuberculous in character, also derives support from the fact that they manifest a local reaction under the influence of Koch's tuberculin. It is, no doubt, true that patients suffering from lupus do not, as a rule, also suffer from recognised tuberculous manifestations such as phthisis pulmonalis. But this is just what one would anticipate, on the view that the virus of the disease is in lupus patients presented in an attenuated form, or that such patients are capable of offering a fairly successful resistance to the micro-organisms. If, further, one may suppose that sometimes such resistance collapses, the cases in which, with lupus in the pharynx and larynx, there is also tuberculous disease in the lungs, may be readily harmonised with the above hypothesis.

SYMPTOMS. — FUNCTIONAL. — Without entering at length into each symptom, it may be said that, whether in the mouth, pharynx, or larynx, the symptoms are slight, and quite disproportionate to the physical signs; a fact in which most observers with practical experience are agreed. In the only case narrated by Gottstein, 'the patient had neither pain nor discomfort in the throat, and was much astonished on being told that her throat was affected by the same disease as her ear' (the primary seat of the lupus). A similarly entire unconsciousness of serious laryngeal mischief was exhibited by Orwin's patient. In three cases mentioned by Homolle, two had no knowledge of any trouble antecedent to cicatrisation. In the case of Asch and Lefferts, however, there was considerable dysphagia, distressing cough with hoarseness, and a sense of obstruction or tumefaction in the throat. Even where the glottis is considerably narrowed,

it is surprising how free the patient may be from distress in breathing; and when this does exist, it is probably due to a fortuitous laryngitis, or to some mechanical attempt to relieve the stenosis.

PHYSICAL APPEARANCE.—I have seen only one case in which lupous ulceration was exhibited in the mouth, apart from those alluded to where the gums were attacked.

CASE CIX.—W. B., æt. 43, a waiter, presented himself at the Throat and Ear Hospital in April 1881, on account of ulceration at the right angle of the mouth, which was of true lupous character, and extended inside the cheek. On the right arch of the palate and involving the uvula was a group of highly inflamed mollusc-like nodules (Fig. CCLXVIII.). The larynx was healthy. There was a large cicatrix on the right side of the neck, of which he could give no history, except that there had been a sore there, which healed before he was 8 years old. He complained of no symptom but the disfigurement of his lip.

FIG. CCLXVIII.—LUPUS OF THE SOFT PALATE.

In the palate I have seen several cases. As the early manifestations of lupus in this region have not been described, I give my impressions at length. In only one other case has the deposit been of such a nodulated character as in that just described. In all, the portion of mucous membrane implicated is somewhat congested, the hyperæmia being more limited than in ordinary pharyngitis: where there is ulceration, the areola is much less vivid than in syphilis, but distinctly more so than in tuberculosis, and with an absence of the general anæmia of the surface, characteristic of the last-named lesion. The ulceration is neither so generally granular nor so superficial as in tuberculosis. It is distinctly more torpid than in either this disease or syphilis. Ulceration of the velum does not appear to proceed from the nasal surface of the palate, as is the rule in tertiary syphilis, but from the buccal; and though in one case I could pass a probe an eighth of an inch or more, there was no perforation. When destruction of tissue takes place it is not as a defined hole, but as a widening gap. I have seen but one case displaying inflammatory nodulation and acute ulcerating ravages to anything like the extent described by other observers, and that was in a child exhibited at the Medical Society by Dr. Colcott Fox, in November 1886. This patient's throat very much resembled that depicted in Fig. 41, PLATE V., only that it was more actively inflamed.

The appearance of the uvula is peculiar. It is not inflamed and œdematous as in syphilis, nor anæmic and shrunken as in

tuberculosis, but it is often swollen as with solid infiltration, so as to give a club-shaped appearance; it is as a rule distinctly congested, and frequently nodulated.

The first case in which I noticed this appearance occurred in my hospital practice in 1881, and is herewith related from the notes in the Hospital Register.

CASE CX.—Ann D., æt. 46, married six years, applied as an out-patient—not on account of her throat, but for otalgia on the right side—at the Central Throat and Ear Hospital, on the 15th of April 1880. Observing a large (healed) lupoid cicatrix on the upper lip, it was ascertained that she had been the subject of tubercular lupus (non-exedens) of the nose, and then of the cheeks, since childhood. The health had always been excellent till the attack of earache, which had commenced a fortnight ago. She had had one child, who had died of bronchitis at six months. A doctor had noticed that her throat was affected sixteen years previously, but it had really never troubled her. There was absolutely no symptom of *voice*, *articulation*, or *deglutition* of an abnormal character, but she stated that her *breath* had always been rather short on exertion or during conversation. On examination of her throat, it was observed that at the tip of the

FIG. CCLXIX.—PALATAL APPEARANCE.

FIG. CCLXX.—LARYNGOSCOPIC APPEARANCE.

uvula was a sessile 'tuberculated' growth of red colour, and on the soft palate two raised red patches, and several more or less distinct spots, much resembling the characteristic 'apple-jelly' appearance of lupus, on the skin. The left posterior pillar was adherent to the pharynx, to which it was bound down by a dense white stellate cicatrix. The larynx was normal, except the epiglottis, the right half of which was much swollen and irregular, with small nodular elevations over the swollen part; the left half was slightly thicker than normal, and had one or two nodules on its superior surface.

It may be added that the otalgia was found to be unconnected with the lupus, and was of a simple character.

The following are brief notes of the palatal and laryngeal cases I saw at St. John's Hospital in the summer of 1886. I pointed out the morbid appearances to either Dr. Harries or Dr. Campbell at the time, and some of them were subsequently verified by the examination of my colleagues, and by visitors on the occasion of a lecture I gave on the subject at the Central Throat and Ear Hospital. It is interesting to note that *in every one there was lupus of some portion of the face*; and to this experience in the eleven cases I have described, No. CVIII. is the only exception.

CASE CXI.—E. G., a single girl, æt. 20, had suffered from lupus for ten years. It had commenced at the lower border of the mastoid, whence it extended to the angle of the jaw. The uvula was distinctly clubbed, red, and nodulated (Fig. CCLXXI.), and the fauces generally congested. The epiglottis was of a red colour, but the outline of its free border was sharp, and the valve free from thickening. The condition of the uvula strongly resembled that described in Gottstein's case.

FIG. CCLXXI.—EARLY LUPOUS INFILTRATION OF UVULA.

CASE CXII.—E. W., a female Ipatient, æt. 17; parents and family healthy. She had a cicatrix of lupus on her neck; her face was hideously disfigured by ulceration, which had commenced at the right angle of the nose, and had extended to the cheek and lips, so that her mouth was dreadfully contracted. It was not possible to see her larynx well. What I did see appeared healthy, but the uvula was red, granular, and clubbed; on its surface as well as just above it on the velum was a shallow ulcer, with raised edge (Fig. CCLXXII.). The patient had never experienced the least pain in swallowing. The voice was somewhat hoarse, but the change had been believed to be entirely due to the effects of the disease in her nose and mouth.

In another case (CXIII.), that of E. D., a female child, æt. 8, there was a similar affection of the uvula (Fig. CCLXXIII.), not so far advanced, and a small shallow ulcer on the superior surface of the left anterior pillar.

FIG. CCLXXII.—EARLY LUPUS OF THE UVULA AND VELUM.

The historical notes of the following two cases are given in Dr. Campbell's own words from his pamphlet:—

CASE CXIV.—'James V., æt. 24; father phthisical, mother healthy, also a brother and sister; some others died in infancy, cause unknown. Fifteen years ago had a *blow on the nose*, followed by ulceration, and shortly after again bruised his face by a fall. Ulceration spread over the whole face, except the forehead, destroying cartilages and septum of nose, attacking both pinnæ, and spreading downwards and backwards towards the back of the neck. Two similar patches of ulceration afterwards appeared on inner surface of left thigh, one on anterior surface of right forearm, and one on inner surface of left upper arm. Six months ago an iron bar fell on second toe of right foot, which soon after developed similar ulceration. There is also a patch on ulnar aspect of right wrist. May 17th, 1886: All these lesions exhibit the typical characters of lupus. The teeth in both jaws are crowded, and the gums swollen and ulcerating. Mr. Lennox Browne diagnosed lupus of larynx and uvula.'

FIG. CCLXXIII.—EARLY LUPOUS ULCERATION OF LEFT ANTERIOR FAUCIAL PILLAR.

The ulcerations of the uvula in this case were deeper than in any of the others, and had decidedly raised margins (Fig. CCLXXIV.). As to the larynx (Fig. CCLXXV.), the epiglottis was very pale and thickened, and at its right interior margin there was slight worm-eaten ulceration, which showed some signs of cicatrisation. The inter-arytenoid fold was thickened; the cords somewhat congested.

CASE CXV.—'A. P., æt. 23; male; good family history. Disease began on the upper lip six years ago, and spread slowly. Was treated with the usual remedies. March 22nd,

1886: Nasal cartilages gone, and nostrils contracted; upper lip red, brawny, thickened; the nodules confluent and ill-defined; a solitary discrete, typical nodule on right cheek, near the nose. On the inner aspect of the right forearm there is a rounded purplish red patch, with edges slightly raised and nodulated. Some cicatrisation in centre of patch, which has, however, never ulcerated. June 8th: Lupus of the larynx was diagnosed by Mr. Lennox Browne on this date.'

FIG. CCLXXIV.—LUPUS OF UVULA AND SOFT PALATE.

FIG. CCLXXV.—LUPUS OF THE LARYNX.

I did not make a drawing of this case, because the laryngeal appearance so closely resembled that in the foregoing, and also in the next.

CASE CXVI.—Louisa F., æt. 16, had suffered from lupus of the nose for five years. Her teeth were characteristically crowded. Lupoid manifestations were absent from the pharynx and fauces, but the epiglottis was pale, with nodulated and solid-looking thickening (Fig. CCLXXVI.).

FIG. CCLXXVI.—THICKENING OF EPIGLOTTIS IN LUPUS.

In addition to the foregoing, I record yet another case in my own practice:—

CASE CXVII.—Eleanor B., æt. 19, single, came under my care at the Central Throat and Ear Hospital on April 29th, 1886, on account of ulceration of the nostril, of which there had been visible evidence for a year; but she had suffered from a certain sensation of discomfort in the anterior nasal passage for a period fully three times as long. She was the youngest of six, all of whom were well and strong, and she herself had always enjoyed good health. Her father was alive, aged 67, and her mother had died at 48, of an abdominal 'tumour.' Lupous ulceration was seen to be destroying the cartilage of the left nostril, and was confined to that spot. The *palate* was normal in form, but rather congested. In the larynx (Fig. CCLXXVII.), the epiglottis, which was very pendulous, was seen to be distinctly thickened, hyperæmic, and flesh-like in texture, and both its free edge and superior surface were somewhat nodulated; the vocal cords and the rest of the larynx were normal. There was not the least discomfort experienced in the performance of any function of the throat.

FIG. CCLXXVII. — INFLAMMATORY THICKENING AND NODULATION OF EPIGLOTTIS IN LUPUS.

I saw this patient again a year later (April 2nd, 1887). The ulceration of the nostril had healed under treatment by scraping and cautery. The laryngeal condition was unchanged.

In three cases (Nos. CVIII., CXI., and CXVII.) there was marked inflammatory redness of the laryngeal mucosa; in others

there was slight congestion. Although in each case that has presented laryngeal signs the epiglottis has been thickened, in only three (Nos. CVIII., CX., CXVII., and CXX.) has there been nodulation; in none was this last-named lesion seen to the excessive extent pictured in text-books; and I cannot but think that observers have been too ready to see this nodular condition, as first figured by Türck, or have ignored as lupus the more ordinary though less marked appearances delineated in the foregoing sketches. Ramon de la Sota of Seville, as he has seen the disease, finds that there is always active hyperæmia, and distinguishes the lupous tubercle by its very red colour from the leprous tubercle, which is opaque, and of a turbid white. It is possible that the habitual use of tobacco among his patients may account for the constancy of the congestion.

DIFFERENTIAL DIAGNOSIS.—The laryngeal diseases with which lupus is likely to be mistaken are *syphilis* and *tuberculosis*. While Gottstein considers confusion of lupus with syphilis almost excusable, Lefferts is of opinion that the demarcation between the two is distinct. This may be granted wherever there is concurrent lupus of the skin; but there is the superadded difficulty that some observers will not admit that necrosis of bone is a crucial test between the two. This, however, is the guide in my own practice, and for it I have the support of Mr. Jonathan Hutchinson. There is, of course, not infrequently great difficulty in knowing when the border line of true lupus has been passed, and this accounts for the fact that some of the best authorities believe that lupus may attack bone. When this does occur, it is, I believe, evidence of syphilitic contamination. The fact that a patient has brothers and sisters, both older and younger, free from any taint, is of really minor importance; and I am entirely in accord with Neisser, who says that 'the *history*, as a rule, is comparatively worthless, whether it points to syphilis or not. In the former case, because lupus coexisting with syphilis presents no striking features; in the latter, because ulcerous syphilis often develops so many years after infection, that the credibility of anamnestic data, in case syphilis is denied, is very slight.' It is far more important to remember, as the same author has stated, that while 'lupus has nothing in common with syphilis in any direction, both diseases may run side by side in the same individual.' The effects of *treatment* are of much greater assistance. In lupus, mercurial treatment always aggravates both the subjective and objective conditions, and an interesting example of this fact is recorded by Ramon de la Sota. Improvement, there-

fore, of the condition, under long-continued medication by mercury, must inevitably confirm our suspicion of a syphilitic origin, or at least of the co-existence of a syphilitic taint.

The **laryngoscopic appearances** of lupus are far more allied to those of tubercle, but the comparative slowness of the pathological process, the absence of pain, cough, and emaciation in lupus, and, above all, its disposition to undergo repair in one part, concurrently with extension in another direction, should make diagnosis not difficult. Hunt well puts it that there are two general conditions of the mucous membranes of the larynx and pharynx which strike one in the majority of cases, viz. *anæmia* and *anæsthesia*. The former when present distinguishes it from syphilis, though it is not a by any means constant symptom; the latter from tuberculosis. The cases of lupus in which there is pain are as rare as those of tubercle in which there is none. A strong point of differentiation from both syphilis and tuberculosis is the fact that lupus of the larynx is almost always supra-glottic, and that the vocal cords very often escape. Another peculiarity which is seen also in leprosy is that the epiglottis, from the weight of its infiltration, very frequently overhangs, and there is also a disposition for it to spread out laterally. This is well seen in several of the figures, and especially in the coloured drawing (Fig. 51, PLATE VI.). All these points indicate that, although there may be certain morphological resemblances, and even some degree of bacteriological relationship, between lupus and tuberculosis, the clinical characteristics of the two maladies contain elements of marked distinction.

One more point. Stenoses in lupus are due to a general matting together of the inflamed tissues, as shown in Fig. CCLXII., and are very different from what is observed in *syphilis* or in laryngeal manifestations of *rhino-scleroma*. It is hardly necessary to go into detail as to the points of differentiation from *carcinoma*, or from *leprosy*.

There remains the possibility in certain cases of doubt of employing tuberculin as a diagnostic agent. Of course lupus cannot in this way be distinguished absolutely from tuberculosis, but the occurrence of a local reaction would negative the suggestion of either syphilis or leprosy. Further, judging from a somewhat limited experience, I should say that the reaction to tuberculin is both slighter and slower in lupus as compared with tubercle.

PROGNOSIS, COURSE, AND DURATION.—The forecast of lupus of the throat may be generally considered as favourable from the

vital point of view, though when the larynx is attacked some danger is to be apprehended at a later stage from cicatricial narrowings of a most unyielding character. The peril is all the greater because interference with these scars by incisions is not unlikely to lead to recrudescence of the ulceration. The course of lupus is always slow, and while it may possibly, in a few cases—not so few, perhaps, as was formerly believed—terminate in general phthisis (? pulmonary luposis), it more often undergoes a spontaneous process of cure by evolution. It is impossible to make any prognostications of value as to the duration of active disease; and in many cases, even when ulceration is arrested, there is lifelong discomfort in speech and in nasal respiration.

TREATMENT.—Abscission of the uvula when attacked by lupus is a sound procedure, and is preferably effected by the galvano-cautery, the use of which, if not employed at too high a temperature, will not be attended by bleeding, and consequently will lessen the possibility of fresh infection. The most generally satisfactory local treatment for lupus in other parts of the throat is thorough curetting, followed by the application of lactic acid, the results being even more satisfactory than is the case in ordinary tuberculosis. The curette must be employed with some energy, and the lactic acid well rubbed in to the exposed raw surfaces. In my experience, nitric acid, chromic acid, the acid nitrate of mercury, and other strong caustics, present no advantage over lactic acid, whilst their tendency to spread beyond the exact site of application, and to act energetically on the healthy tissues, is a very decided drawback, from which the use of lactic acid is free. Perchloride of mercury, 1 in 500, applied as a powder or paste, is sometimes useful, and, in this degree of dilution, may be regarded rather as a germicide than a caustic. It is hardly necessary to add that it must be used with a sparing hand. Iodine, iodoform, and mineral astringents—all recommended by various authors—I have not found of the least value. Ramon de la Sota recommends resorcin in 1 per cent. solution as a gargle, mouth-wash, and spray, as the best means of disinfecting the mouth, throat, and nose. Seifert has found parachlorophenol useful in cases of lupus of the nose. The fact that the galvano-cautery is well borne in lupus of the throat is by some considered to be an argument in favour of its suitability, but I am by no means inclined to concede this.

Intubation and the use of bougies are not advisable. They can scarcely be expected to effect a cure, and the local irritation they excite is only likely to lead to more active manifestations

of the disease, and so to hasten the necessity for tracheotomy. My position indeed is, that no such measures should be adopted until after **tracheotomy** has become necessary. That necessity only exceptionally arises, for the reason that glottic stenosis is a rare complication; but in those cases in which a tracheal tube has been introduced the operation is reported to have exercised a favourable influence on the progress of the disease. More heroic surgical measures, such as laryngotomy or pharyngotomy, considering what we know of the natural history of lupus, can be rarely if ever justifiable. Nevertheless each has received practical advocacy.

Of internal treatment, all remedies applicable to the tuberculous may be beneficial. Such, for example, are the hypophosphites, the glycero-phosphates, and various preparations of iron and arsenic. When there is evidence of a syphilitic taint, Donovan's solution may be substituted for Fowler's. Cod-liver oil, with or without maltine, may be employed to meet emaciation, if this is a feature of the case; but decided loss of flesh is not usual in lupus, and would signify more active and deeper-seated organic changes. Byrom Bramwell has noted progress in some cases of lupus of the skin, under the administration of thyroid gland, but I am not aware that it has been tried when this disease attacks the throat. Certainly it is a universal experience, that this remedy has been of more service, and has been attended with less serious untoward results, in lupus than in active tuberculosis. From what has been said in a previous chapter, in reference to the use of *tuberculin* in tuberculosis of the larynx, one can scarcely take the responsibility of urging the use of this remedy in lupus. Nevertheless cases have been benefited by it, and there is encouragement in the observation of Malcolm Morris, that lupous patients who have been treated by tuberculin are apparently more amenable to surgical measures. The three following cases are inserted as faithful records of treatment by the **new tuberculin** and surgical measures in combination.

It may be premised that the tuberculin employed is that manufactured by Dr. Libbertz of Berlin, assistant to Professor Koch. The treatment is commenced with a solution, 5 minims of which are equivalent to $\frac{1}{500}$ of a milligramme of solid substance. Beginning with a minim of the solution, the dose is increased by that amount each day, and then, when the bulk of fluid inconveniently increases, the amount of the diluent is proportionately diminished; a dose of 5 milligrammes can be thus obtained, or even 20, which is the limit advised by Koch. Up

to the present I have not exceeded 3 milligrammes, and the result of that dose did not encourage me to continue the treatment.

CASE CXVIII.—*Lupus of the nose.*—Willie U., æt. 14, admitted on February 8, 1898, under my care, conjointly with that of Mr. Wyatt Wingrave, who had been treating the boy for some time previously as an out-patient, on account of a swelling and soreness of the nose which had existed for six years. The trouble had first commenced just inside the right nostril, and had gradually spread so as now to involve the whole of the cartilaginous portion, with a marked ulceration under the left nostril, and several raised pinhead patches of a heightened colour on each cheek. The boy was born two months after the death of his father, by phthisis, at the age of 30. Personally, the only illnesses he had had were rather frequent attacks of slight biliousness.

On admission, the end of the nose and alæ were seen to be swollen, red, and nodular, the redness extending upwards along the bridge. The nostrils were much narrowed.

The first injection of the minimum dose of new tuberculin was given on the day of entry, and was increased in the manner already indicated. No reaction took place till after the seventh or eighth injection, and was then only evidenced by a slight rise in temperature about 5 or 6 p.m.; this declined before 10 p.m., and was subnormal in the morning. The variation was never more than one degree above normal at evening, and one degree below at morning. The time of these variations was the same whatever the hour of the injection, and it was observed in all my three cases. Twenty-four injections were made before any local treatment was attempted, and the dose represented about $\frac{1}{8}$ of a milligramme on that date, March 4. The boy's health had in no way suffered, but had rather improved, and he had gained in weight.

The affected surfaces were freely curetted with the after vigorous application of lactic acid on four occasions, at intervals of a week. In all, fifty doses were administered during the seventy days the boy was in the house. And although the new tuberculin did not unfavourably affect the general health, it could not be said to have exercised the slightest beneficial influence. In fact, the boy went out, so far as his local trouble was concerned, much as he entered.

CASE CXIX.—*Lupus of the tongue, fauces, and larynx.*—Lilian G., æt. 14, admitted January 31, 1898—also under the joint care of Mr. Wingrave and myself—on account of loss of voice, almost to the extent of complete extinction, which had come on without apparent cause some eighteen months previously. Beyond measles and mumps the patient had no illness. She was one of seven, of whom the rest, three boys and three girls, were all alive and well. Her father and mother are also alive and in good health.

On examining the throat, there was seen to be a large raised patch of nodular infiltration on the right side of the *tongue* just behind the circumvallate papillæ; the *uvula* was also thickened and nodulated, while on the *pillars* of the *fauces* were scattered patches of lupus. The *larynx* also was affected, as seen in the accompanying drawing (Fig. CCLXXVIII.). There was no actual lupus of the nose, but the nostrils were seen to be obstructed by some nodular thickening. Treatment by the new tuberculin was commenced on the day of admission, and injections were made exactly as in the last case. No reaction took place till after the eighth injection, when complaint was made of excessive urination and an occasional feeling of hot flushes, but the temperature did not rise during the whole course above 99° F. Treatment by curettage and lactic acid was not commenced till March 14, when thirty-eight injections had been made. From this date some slight improvement was manifested, but those who watched the case agree that the progress was no more satisfactory than is usually observed by surgical procedure alone.

FIG. CCLXXVIII.

CASE CXX.—*Lupus of the fauces, lingual tonsil, and larynx* (Fig. 51, PLATE VI.).—Mrs. H., æt. 35, brought to me by Dr. Sinclair White of Sheffield, January 13, 1898.

The patient had been married thirteen years, and is the mother of one child, aged 11, and in good health. There had been no miscarriages.

Beyond an attack of influenza, three or four years previously, the patient acknowledged to no illness, but it was later elicited that some eight years ago she suffered from a sore on her nose, which Dr. White of Bradford, her medical attendant at that time, declared to be lupus. It took a long time to heal and had left a slight scar, but it had not returned. She had also scars of granular abscesses under the angle of the jaw.

The reason for her now seeking advice was a disorder of the voice, which, almost always hoarse and but very rarely natural, was at times entirely lost. No pain in either speaking or swallowing was complained of, nor was there any sense of suffocation or distress.

Physical examination revealed a highly hyperæmic condition of the *left posterior pillar* of the *fauces* and *tonsil*, which parts were also studded with several minute ulcers, strongly resembling those of tuberculosis. In the *laryngeal* mirror, *the lingual tonsil*, especially on the left side, was seen to be much enlarged, inflamed, thickened, and in parts ulcerated. The epiglottis was also inflamed and nodulated with the characteristic lateral and pendant wings. The vocal cords could not be made out, on account of the considerable mass of lupous tissue which filled up the vestibule of the larynx and extended below the glottis. The glottic area was diminished in full inspiration to at least a third of the normal. The whole tissues were generally infiltrated, and of a dusky, but not deep red colour. The right ala of the nostrils was somewhat thickened and red. There was also a small bleeding spot at the vestibule, which the patient explained as the result of a small scab which had come off that morning when using her handkerchief.

The *treatment* in this case has consisted in very vigorous curetting, removal of considerable pieces from the lingual tonsil and from the epiglottis with punch-forceps, and from within the larynx by a Gibb snare, by Krause's laryngeal pincettes, and Heryng's knives. This was followed by equally active application of pure lactic acid. These measures were pursued nearly daily for six weeks, and subsequently, on two consecutive days once a week. From February 2, injections of the new tuberculin were made, and about twenty-five in all were given. Although there was on the whole but slight temperature variation, the patient's health was somewhat disturbed, so that they had frequently to be remitted and finally discontinued.

FIG. CCLXXIX.

July 1898.—The present state is depicted in Fig. CCLXXIX., and the contrast between it and that on her first visit, as shown in Plate VI., is evident. With this, albeit only the left vocal cord can be distinctly made out, the voice has been restored to a perfectly clear tone. Lastly, the general state is greatly improved, and the weight is exactly the same as on commencement of treatment, though there was a slight falling off while the patient was in town. I cannot, however, claim that any of the benefit is due to the tuberculin. The permanency of the cure of her nasal lupus, and the unusual amount of improvement under the course of treatment recently pursued, may be accepted as an evidence that this patient is more than ordinarily amenable to surgical procedures.

A few words remain to be said regarding a form of pharyngeal and laryngeal disease, in which a **syphilitic** manifestation occurs in a person of scrofulous, strumous, or lupous diathesis. As to *etiology*, there is nothing to add to what has been said in regard to so-called scrofulous ulceration of the pharynx, and to repeat that, while the *diagnosis* of faucial, pharyngeal, or laryngeal lupus, if unaccompanied by a previous or concurrent

cutaneous manifestation, is to be considered dubious, the existence of necrosis of bone should at once point to the probability of the case having a syphilitic basis.

Two instances are here appended as types of lesions that are often ignorantly called *lupoid* or *lupoid syphilis*. They are inserted in this situation *solely* to enforce the question of *diagnosis*. The first is an illustration of a laryngeal affection which, occurring in a patient phthisically inclined, strongly resembled lupus, but without cutaneous corroboration, and with therapeutic evidence of syphilis. The second is one of cutaneous disease of the character of lupus, but with ulceration of the palate and with laryngoscopic signs which clearly establish it to be also syphilitic.

CASE CXXI.—Elizabeth C., æt. 26, married eight years, and with one child 5 months old, came under my care at the Central Throat and Ear Hospital in March 8,

FIG. CCLXXX.

A. LARYNGEAL APPEARANCE, March 8, 1886.

B. THE SAME, February 18, 1887.

1886, complaining of soreness of the throat and loss of voice, which had existed for seven weeks, and was believed to be due to cold. Her *voice* was reduced to a whisper. There was a slight dry *cough*, rather worse at night. She said that her *breathing* was short at times, but *deglutition* was easy and normal. The *pain* was described as a smarting, with dryness in the larynx. Her tonsils were rather enlarged, especially the right; the back of the pharynx was granular. Beyond the graphic note of alteration in the configuration of her larynx, as rendered in facsimile in Fig. CCLXXXA., no remark was made on her case-paper as to laryngeal change beyond 'slight congestion.' On examination of the chest, 'some dulness was noticed at the front of left apex, but no râles, and good inspiration.' She was ordered hypophosphites and cod-liver oil. She only attended for three weeks.

FIG. CCLXXXC.—FAUCIAL APPEARANCE, February 18, 1887.

On February 18, 1887, this patient returned, and came under the care of my colleague, Dr. Jakins. She stated that she had got much better by previous treatment, but that for the last five months her sore throat had returned, her *breathing* was more difficult, her *taste* was impaired, but there was *no pain*

whatever. Her tongue was seen to be glazed, deeply cracked, and superficially ulcerated. Her uvula was swollen and thickened; and it as well as the soft palate and anterior pillars were thrown into thick folds with deep rugæ between them (Fig. CCLXXXc.). The posterior wall of the pharynx was still somewhat granular. The nodulated and thickened condition of the larynx previously noted had decidedly increased, as may be seen by comparison of the laryngoscopic figure (CCLXXXB.) with that first delineated, and almost exactly simulated that of true lupus. The lungs (repeatedly examined, and by various members of the staff) appeared quite healthy, both on percussion and auscultation. In consultation with Dr. Jakins, I expressed an opinion that the case was now undoubtedly syphilitic, and the result of treatment by biniodide of mercury, combined with cod-liver oil and antiseptic oro-nasal inhalations, soon confirmed the diagnosis.

It is to be noted that in this case there was no manifestation on the skin, but there was existence of a condition of the tongue more allied to syphilis than to lupus, and a sister was similarly affected in that respect. There was also doubtful evidence of incipient tuberculosis. In both this and the following cases the syphilitic dyscrasia was probably congenital or inherited, though sterility for the first seven years of married life in the first is capable of other interpretation.

CASE CXXII.—Jane S., æt. 20, single, attended the Central Throat and Ear Hospital as an out-patient in November 1885, and again in February 1887. The following history was obtained at the time of her second attendance. She thinks she had always been 'ill' from birth and in early life, but remembers that she was quite well at 7. When 12 years old was bitten on the nose at the inner canthus of the right eyelid by a gnat; remembers, however, that there was a scar on the nose before this, but never a sore. [There are also several depressed circular scars on the thighs and calves, of the origin of which she has no recollection.] After the bite she had an abscess of the nose, and about this time her mouth became bad: an ulcer formed in the palate and proceeded to perforation. She was treated at various hospitals and convalescent homes on and off for two years, and her nose nearly healed, but the right eyelid discharged and was drawn down by cicatricial contraction; it remained thus until November 1885, when she lost her voice without pain or soreness. This improved under treatment here, but has never been completely recovered. Soon after this time the nose became again affected, and spread from the right inner canthus downwards to the cheek, and the patient was admitted to Middlesex Hospital under Mr. Lawson. At that time the eyelid, although drawn down, was not ulcerated. After a stay of three or four weeks, she left, with the patch on the nose and cheek *quite healed*.

During the last month the disease has spread to the inner half of both upper and lower lids. It now involves the angle between the canthus and nose, also the bridge of the nose, and creeps superficially down the right side of the nose to the cheek, and it has for the first time involved the ala of the right nostril, a portion of which is destroyed.

FIG. CCLXXXI.

There is a central perforation of the hard palate of the size of an ordinary lead pencil, jagged eroded ulcers along the central raphé of the soft palate, and adhesion of the uvula to the right faucial pillar. With the *laryngoscope* (Fig. CCLXXXI.) the epiglottis is seen to be red and thickened, and with a slight fissure in the centre. There is no active ulceration, but concurrently with the inflammatory thickening the free edge is notably white and nodulated. With the exception that the epiglottis is inflamed, the

appearance of the free edge strikingly resembles the coloured illustrations of syphilis in Figs. 61 and 67, PLATE VII., at the end of this Book. The vocal cords are of a dirty reddish grey colour, and, so to speak, degenerated in substance, but so far as can be seen are not ulcerated.

The *teeth* are irregularly shaped, small, and pegged in the upper jaw; more regular in the lower. Nothing abnormal in the optic discs can be discovered with the ophthalmoscope. The *family* history is apparently good.

In the second case, the appearances of the face, eyelid, and larynx strongly resemble those of lupus; but necrosis of the hard palate and certain other commemorative points clearly established a syphilitic origin of the malady. The history of the gnat-bite would point to traumatism as the exciting factor of the ulceration, and might encourage a thought that the truly lupous nature of the disease was established; but the pre-existence of a scar renders such a hypothesis untenable. I once (1887) saw a very similar case in consultation with Dr. Campbell. There was a succinct history of a blow on the nose from a stone as the first cause of a nasal disease which had destroyed both bone and cartilage, but on cross-examination there was clearly pre-existence of inherited syphilitic lesions. There is, of course, equal probability that traumatism may excite to active disease in the syphilitic as in the lupous dyscrasia.

CHAPTER XXV

LEPROSY OF THE NOSE, MOUTH, PHARYNX, AND LARYNX

IT will be convenient to consider at one and the same time the manifestations of leprosy in the buccal cavity and in the different parts of the upper air passages. The justification for such a course is similar to the one which has been pleaded in the case of lupus; but, in the present instance, the manifestations of leprosy in the nose are included for the special reason that this is always the portion of the air passages first attacked.

The interest of the disease in the present state of science is, it must be confessed, rather pathological than practical, for, in spite of one or two reported cures, treatment is of but little avail to arrest its progress.

The International Conference on Leprosy, held at Berlin so recently as October 1897, has added very much to our knowledge of the phenomena of leprosy in general, and has elicited specially valuable information concerning the clinical features of the disease when it attacks the upper air passages. Of these contributions mention must be made of those submitted by Leopold Glück of Sarajevo, and by Jeanselme and Laurens of Paris. The observations of Glück were made in a leprous district, on thirty-seven cases of leprosy affecting the air passages; whilst those of Jeanselme and Laurens, numbering twenty-six of general leprosy, had been studied in Paris. Of these, sixteen—otherwise 60 per cent.—Hillis gives 75 per cent.—betrayed evidences of the disease in the buccal cavity or the upper respiratory tract. According to Glück's experience, the nasal cavity suffered in 90 per cent. of his cases, the larynx in 70 per cent., and the buccal cavity and tongue in nearly 50 per cent. In the great majority of instances, leprosy attacks the skin much earlier than the mucous membranes, but in some cases the disease has been reported to have actually commenced within the nasal cavity.

It is mainly with the nodular variety of leprosy that manifestations are met with in the nose, but occasionally such

developments complicate the anæsthetic and mixed forms of the disease. Such an occurrence—rare in the nose—is still more rare, so far as the mouth, tongue, and throat are concerned.

In describing the clinical appearances of leprosy, I have availed myself largely of the recent contributions of the authorities just quoted, using their observations to complete in detail the picture of the disease, according to previous knowledge, as it had presented itself to me during my visit to the leper establishment in Robben Island, South Africa, in 1889. I am also fortunate in being able to add to the report a recent case in my own practice, and to present a picture of the appearances in palate and larynx as I was then able to see them.

HISTO-PATHOLOGY.—The main characteristic of leprosy, whatever its variety, is to attack structures of dermal nature and dermal origin, a quality which is strikingly shown when the disease is manifested in the regions now under notice.

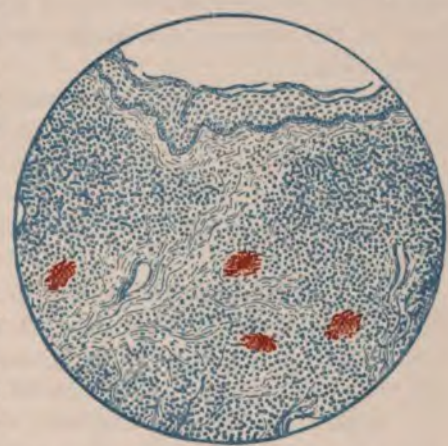


FIG. CCLXXXII. — SECTION OF NODULAR LEPROSY, FROM ALA OF NOSE (⅛ *in. Obj.*).

And this may explain why the nose, mouth, and larynx should be so early selected for invasion, all of them being wholly or in part connected with the epiblastic involution constituting the stomodeum.

The **microscopical** changes of leprosy differ somewhat in the two varieties. Those of the **nodular** or **tuberous** character commence as an accumulation of lymphocytes in the perivascular lymph spaces, forming a network of infiltration strands which, increasing in thickness, appear under a low power as solid cylinders, invading and absorbing the intervening tissues (Fig. CCLXXXII.). These 'cast'-like processes also have a special tendency to spread along the perineurium and to occasionally become pigmented.

In section under high power these strands appear like nodules with giant cells; and if stained by the Ziehl-Neelsen or Gram's method, are seen to contain bacilli. The giant cells are not so numerous as in either lupus or tubercle, whilst the bacilli, instead of being irregularly distributed, as in tubercle, are more fre-

quently clustered together in oval-shaped masses, peculiar to this disease.

These masses may be formed by clusters of bacilli—(1) In the protoplasm of large epithelioid cells; (2) in vacuoles or hyaline spheres formed inside those cells; (3) in the matrix between the cells; or (4) in the lymph vessels.

According to Herman of Cape Town, the bacilli do not often occur in the cells, but more generally in vacuoles, which are not necessarily intra-cellular.

In the *anæsthetic* form bacilli are not easily demonstrated; they can, however, be seen in the inflammatory cell tissue, growing along the perineural lymph spaces. Jeanselme failed to demonstrate them in the spinal cord, and the definite sclerotic and pigmentary changes therein found he concluded were due, not so much to the action of the bacilli themselves, as to their products—leprotoxins.

These sclerotic changes Jeanselme found chiefly to involve the posterior roots, Goll's column, and the crossed pyramidal tract; whilst the cells of the anterior cornua showed marked chromalolysis.

Von Babes found bacilli in the spinal cord in nine out of twenty-two autopsies.

The specific bacillus of leprosy, or Hansen's bacillus, has certain peculiarities which distinguish it from the bacillus of tubercle. It is from 5 μ to 6 μ in length, and 0.35 to 0.5 μ in thickness. The rods are said by v. Babes to be interrupted by non-staining clear spaces, representing doubtful spores. They are, as a rule, readily stained *in situ*, or may easily be demonstrated by the trituration method, aided by boiling and digesting.

Herman recognises at least two kinds, according to their staining behaviour. 1. Those which part with fuchsine readily, and consequently stain blue; these he considers to be recent or very active bacilli. 2. Those which retain the fuchsine on decolorising, and represent older and less active bacilli. These in turn vary considerably in tint. One marked histological feature is the tendency of the bacilli to spread as densely packed rod-like clusters in the axis of the strands of small cell tissue, and in the lymphatics.

The bacilli occur both in the blood and in the lymph. Herman has even demonstrated them in the walls of blood vessels. They are not common in the spleen, but are readily found in other viscera, excepting in the case of the anæsthetic variety, when, according to Impey, the lymph glands are rarely,

and the internal organs are never, the seats of bacilli. It is therefore not surprising that they are not discoverable in the secretions, normal or morbid, of anæsthetic leprosy; yet in the nodular variety they are considered one of the earliest diagnostic features, especially in the blood of leprous epistaxis.

Recent observations of Bergengrun and Kanthack confirm the view—that the bacilli are not intra-cellular, and that the so-called inclusion in vacuoles are actually intra-lymphatic thrombi, due to blockage by bacilli.

LEPROSY OF THE NOSE.

Of the parts now under consideration, the nasal mucous membrane is the one in which the disease usually commences.

SYMPTOMS AND PHYSICAL APPEARANCES. — The first symptoms of nasal invasion by leprosy are those of a persistent **coryza** which, accompanied as it is by the formation of crusts, leads to more or less nasal obstruction. The secretion from the nose contains Hansen's bacillus, and may therefore be the means of spreading contagion; and this result is, of course, all the more likely to occur in those instances in which the attack of the disease on the nasal mucous membrane precedes any cutaneous changes; the leper in such a case not having the least suspicion of the specific nature of his coryza. In addition to coryza, **epistaxis** is an early and important symptom. It may be very free, or, on the other hand, may be but limited in amount, occurring only with the forcible expulsion of the firm crusts. This symptom tends to diminish as the disease advances. There are also alterations in the external appearance of the nose. The bridge broadens, while the integument becomes thickened, the nose gaining in breadth what it loses in length; the orifice of each nostril becomes circular in shape, the aperture assumes a vertical plane, the whole presenting the appearance which the French have termed '*nez en lorgnette*.'

Then the cartilaginous framework commences to yield, till, the septum no longer offering resistance, the key-stone drops and the bridge of the nose collapses, as in syphilis, so that in the end the orbits and upper jaws are connected by a median valley. In the early stage of the disease, rhinoscopic examination shows the nasal mucous membrane considerably reddened, turgid, swollen, and prone to bleed on the slightest touch; subsequently, brownish crusts, the remains of previous hæmorrhages and erosions, covered with a layer of muco-pus, are found. The distinctive lesions are the leprous nodules, which are characterised

by their whitish or pinkish grey colour, contrasting vividly with the deep red colour of the rest of the membrane. The nodules, which in early stages may be florid in tint, are usually isolated, but they have a tendency to become confluent, and so produce a thick, somewhat warty layer on the surface of the normal mucous membrane, from which it is distinguished by the softness and resiliency of the infiltration. These conditions combined may lead to a complete **stenosis narium.** Perforation of the cartilage is very apt to occur, and does so by an insidious process of resorption, without discharge of slough or other incident likely to attract the patient's attention. At no time is an area of cartilage found to be exposed, and this is of some diagnostic moment. Another important feature of the disease is the more or less pronounced anæsthesia. Notwithstanding this, the olfactory sense usually retains its normal acuteness. The later stages of leprous rhinitis are characterised by a marked atrophic tendency, and by a pallor as striking as the early hyperæmia.

DIAGNOSIS.—From *syphilis*, which, in its advanced stage, produces a somewhat similar external deformity, nasal leprosy is distinguished by its attacking both nostrils simultaneously, whereas syphilitic ulceration is usually one-sided; by the presence of the characteristic nodules and by the anæsthesia of the mucous membrane. *Lupus* differs in the firmer nature of the new growth, which infiltrates the soft tissues and prevents collapse of the nose even when the septum is perforated. Its obstinate progress, too, and the determination with which it proceeds to gradual destruction of the cutaneous tissues, leaving only the bridge of the nose remaining, are distinctive evidences of lupus, which distinguish it from syphilis; while the rarity of attack by leprosy of the nose or mouth prior to cutaneous evidences, further diminishes the probability of a mistake in regard to this disease.

LEPROSY OF THE MOUTH AND PHARYNX.

In buccal and pharyngeal leprosy the earlier evidences are in the form of smooth patches on the tongue, and afterwards of prominent nodules, as seen in Fig. CCLXXXIIA.; though occasionally the oro-glossus is free from the disease, and only the pharyngo-glossus is infected. There is great exaggeration of the median furrow along the dorsum, with intervening infiltrated and anæsthetic areas. The special sense of taste, however, is not seriously impaired.

Some cases of leprosy of the tongue might readily—apart

from the history—be mistaken for tertiary syphilis. Leprous nodules also appear on the soft palate and uvula, and both of these structures may assume a gristle-like consistence from general infiltration, a condition which seriously interferes with their mobility. The hard palate, too, is sometimes involved. Ulceration may result in considerable destruction of tissue.

I saw one case (No. CXXIII.) at Robben Island, in which there was extensive and deep ulceration of both the hard and the soft palate, of the whole surface of the tongue to its root, of the uvula, and of all the visible pharynx. In this case, in spite of lesions so extensive, there was neither pain nor difficulty in deglutition, and this absence of functional disturbance is one of the most remarkable features of the disease.

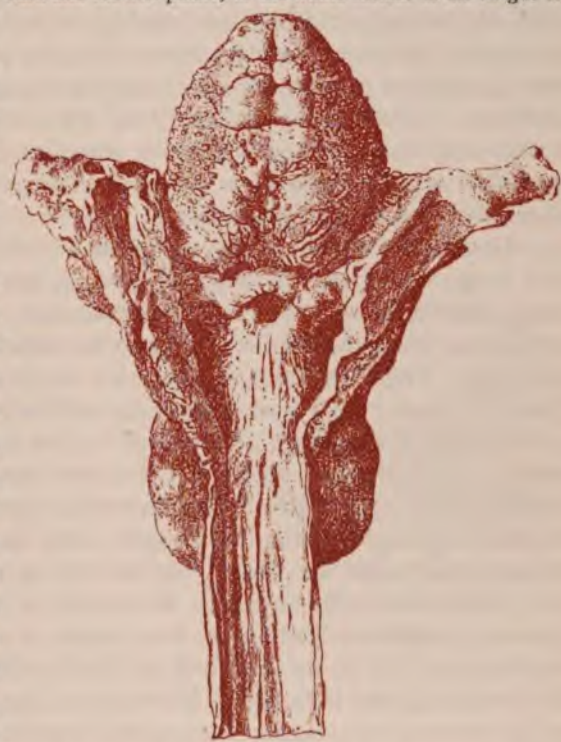


FIG. CCLXXXIIA.—LEPROSY OF THE TONGUE AND EPIGLOTTIS (AFTER GLÜCK).

In the able essay of Morell Mackenzie, out of twenty-five cases tabulated, dysphagia is reported as present in one only. This author justly observes that 'it is wonderful how slight the pain often is, even in cases where the whole mouth, tongue, and fauces, as well as the pharynx, are extensively involved.'

The pharynx in leprosy always betrays evidences in a greater or less degree of chronic inflammation, probably the result of the compulsory mouth-breathing. Hypertrophy, more or less marked, of the various tonsillar tissues is another (early) feature of the disease, and the same hypertrophic tendency manifests itself in the cushion-like swelling at the pharyngeal orifice (tubal tonsil) of the Eustachian tube. Comparatively early, however, in the progress of a case, these glandular structures become atrophied.

Definite leprous nodules may often be noted on the anterior palatal pillars, and in the lacunæ of the faucial tonsils. Scattered over the area there are to be seen several slight erosions, and, when covered, as they often are, with a diphtheroid exudation, they closely simulate a nest of mucous patches, from which, however, they can be distinguished by the absence of symmetry in the necrotic patches, by the surrounding nodular induration, and by the existence of anæsthesia.

The condition of the nose and throat explains the tinnitus, and diminished acuteness of hearing, of which lepers sometimes complain; but there may be, from extension of the virus through the Eustachian tubes, actual pathological changes in the tympanic cavities. Considerable deformity of the auricle is, moreover, a recognised result of the cutaneous manifestation of the disease, and this, by interfering with air conduction, may of itself lead to deafness more or less pronounced.

DIAGNOSIS.—As already mentioned, some cases of leprosy of the tongue undoubtedly suggest *syphilis*, but the history of the case, the presence of anæsthetic patches, and the cutaneous evidences, when these exist, ought to be sufficient to establish the position. The similarity between the early stages of *lupus* and those of leprosy may lead to greater difficulty. In the selection of the uvula for primary attack, and in the succession of hyperæmia, induration, and ulceration, the two diseases advance along similar lines. Extensive loss of tissue is, however, decidedly more common in leprosy than in lupus; but in many cases chief dependence might be placed on the changes in the skin, which are pre-eminently distinctive. Moreover, in the condition of the mucous membrane itself, there is a point of distinction of great importance. It is, as described by Mackenzie, 'the pale yellow, thickened, glazed look which [in leprosy] characterises the whole of the mucous membrane of the mouth and throat, an appearance which might almost suggest that all the parts had been infiltrated with tallow.' Hillis, formerly of Demerara, finds this 'pale, pallid, bloodless condition at a very early stage of every case of tuberculated leprosy which affects the throat, and he likens it to that of a person suffering from pernicious anæmia.' I agree with these descriptions as valuable aids in the recognition of leprosy in the throat, but I have certainly seen appearances not entirely dissimilar in advanced cases of lupus; on the other hand, they are by no means constant in leprosy. I would add, from personal experience, that the whole of the soft palate is involved, both in nodulation and thickening, in leprosy, to an extent never seen by

me in lupus. The distinction from tuberculosis of the palate is easily made by difference in the character of the ulcerations, and above all by the anæsthesia of leprosy, as contrasted with the acute agony in true tuberculosis, even in its initial stages.

LEPROSY OF THE LARYNX.

In the larynx, the part most frequently, and certainly the earliest, attacked by leprosy is the epiglottis. The initial changes display themselves in the form of small greyish insensitive nodules on the laryngeal aspect. They cause little or no inconvenience to the patient. Later, however, when the epiglottis itself, together with the ary-epiglottic folds, becomes transformed by infiltration into a hardened or immovable turban-like mass, the functions of the larynx may be gravely compromised. Often, too, the inter-arytenoid region is attacked. The surface of the posterior commissure resembles folds of velvet-like thickening, and is sometimes covered with dried secretion. At times the whole of the mucous membrane of the larynx undergoes a change of the nature of a pachydermia. In a given case, it is, however, often very difficult or even impossible to say what is the exact condition below the level of the epiglottis, on account of the extensive thickening and fixation of that cartilage in an overhanging position (Fig. CCLXXXIII.).

FIG. CCLXXXIII.—LEPROSY OF THE LARYNX.

Mackenzie has, however, described a case, in which the epiglottis being eaten away, he was able to observe the thickening of all the parts forming the upper circumference of the larynx, arytenoid cartilages, ary-epiglottic and inter-arytenoid folds. The cords also were infiltrated and ulcerated.

More numerous and more careful observations, especially those of Bergengrun, prove that implication of the vocal cords is both late and exceptional.

My experience is quite in harmony with the accepted description of the changes in the larynx, namely, that they are of the nature of a general thickening, which, while more or less nodular in character, does not present evidences of separate nodules to the extent that is seen on the soft palate; and whilst ulceration no doubt may occur, loss of substance is due for the most part to a process of absorption, similar to that which occurs when the disease attacks the hands or feet. In forty cases

tabulated by Hillis, the epiglottis was markedly thickened in eleven, destroyed by ulceration in one so that only a 'stump' remained, but in only two instances were distinct nodules recorded in this situation.

The disease may extend to the trachea and bronchi, but respects the lung tissue and also the œsophagus.

THE SUBJECTIVE SYMPTOMS of leprosy of the larynx are interesting, and are exhibited in connection with the functions of phonation, respiration, and deglutition. It is remarkable, however, how slight in some cases is the degree of functional disturbance, even though the structural changes are considerable. The alteration in the **voice** may range from slight loss of purity in its tone-quality, and failure of the higher notes of the scale, to considerable hoarseness and even absolute aphonia. In some cases these changes may be explained by the mechanical interference with the movements of the vocal cords produced by a species of trachoma,—the development of nodules,—to destructive lesions of the cords, or to inter-arytenoid pachydermia; in other cases the phonatory defect would appear to result from imperfect closure of the glottis, due to paresis of the laryngeal muscles. The tone quality is in the earlier stages that generally understood as nasal, and by some it has been characterised as shrill, but, as has just been said, the pitch is always lowered. As in lupus, the function of **speech** is seldom painful. Of difficulties of **deglutition** I have already spoken, and there only remain a few words to be said in regard to disorders of **respiration**. A certain amount of **dyspnœa** will be observed in all cases, since stenosis of the glottis is the prominent feature whenever the larynx is attacked. In a morbid specimen, kindly brought under my notice by Dr. Phineas Abraham, the glottis had been reduced to the size of a duck-quill, and tracheotomy had become necessary.

From statements of various authors, it is possible that both the respiratory disturbance and the consequent indications for opening of the windpipe may vary according to the geographical situation of the leper colony. I did not find a single recorded case in which the operation had been performed at Robben Island, albeit I was told that death of lepers by œdema of the glottis was by no means uncommon at that station.

TREATMENT.—All remedial measures, including tracheotomy, must be considered as palliative. Hygienic and dietetic measures, suitable to the general disease, must not be neglected. De la Sota is the only author of note who has recorded any beneficial

results; these he obtained by the application of resorcin and iodoform in ether. Hypodermic injections of perchloride of mercury have been also advised, but, both on account of the admittedly imperfect diffusive power of the drug, and the unfavourable conditions of the disease to distant transmission, the results are not very satisfactory. I am not aware that serum therapy has yet been attempted; with bacteriological information of such a definite character as is possessed with regard to leprosy, the indications appear favourable to experiment, while the hopeless character of the malady affords—if it be needed—a further justification for its adoption.

The following example of leprosy was seen by me, in consultation with Surgeon Lieut.-Colonel Oswald Baker, on March 19, 1898, many weeks after the foregoing description of the disease had been written, and is interesting, not only on account of the rarity with which one witnesses the disease in this country, but also because both the history and the pictures strikingly confirm the now generally accepted signs and symptoms of the malady.

CASE CXXIV.—The patient, æt. 50, was of Eurasian origin, and born in North-Western India, where he had resided until the last twelve months. His attack of leprosy dated back fifteen years. It was of the nodular variety, and had commenced on the arms and legs, to later invade the whole body. There was general diminution of peripheral sensation, but no marked anæsthesia.

Some months before I saw him, the patient had suffered from threatened blindness, on account of opacities of the cornea due to leprous deposit; these had been successfully treated by Mr. Percy Dunn. He had also seen Dr. Phineas Abraham.

Throat symptoms, which had commenced with hoarseness and huskiness of voice, dated back less than three months. There had been no pain in swallowing, nor dyspnœa. The olfactory and the gustatory senses were unimpaired.

The patient on inspection presented all the facial and cutaneous characteristics of leprosy.

The **nasal fossæ** had been attacked long previously, and epistaxis had formerly been frequent. The septum had been perforated, but the bridge of the nose had not fallen in to the extent often seen; nor did the nostrils present, except in a partial degree, the appearance known as the *nez en lorgnette*.

The **soft palate** was seen to be involved in its entirety, and even the mucous membrane covering the bony roof of the mouth was also affected. As shown in Fig. CCLXXXIV. the whole surface was of a moderately pink colour,—by no means white or even unduly pale,—and was studded with nodules of varying size. The tissues were much thickened, and had lost all power of muscular contraction, nor did they respond to irritation. A few superficial erosions were observed, and one or two small islets of apparently unaffected mucous membrane were visible.

In the **larynx** (Fig. CCLXXXV.) the *epiglottis* presented all the characteristics of the disease described by Hillis and others. It was very much thickened, somewhat but not prominently nodulated, so that no separate irregularities could have been removed, as in lupus. The upper surface of the valve and its attachments, and even the valleculæ, were clearly visible. The colour was a palish pink, with whiter patches, where the nodules showed, and at the site of one or two erosions which were quite superficial. In this

respect of colour and form the epiglottis was strongly distinctive from the grey anæmia of tuberculosis, with 'mouse-nibbled' ulcerations, in its more common chronic manifestation; from the active hyperæmia seen in its (rarer) acute form; from that of lupus, which gives the tint of subacute laryngitis; and from syphilis, by the greater infiltration and the absence of destructive ulceration. The *ary-epiglottic* folds and the coverings of the *arytenoid cartilages* were greatly swollen; and although the latter presented the pear-like swellings associated with tuberculosis, their outline, while presenting no definite nodules, was less regular. The intervening space between the cartilages—*posterior commissure*—

FIG. CCLXXXIV.—LEPROSY OF THE SOFT PALATE.

FIG. CCLXXXV.—LEPROSY OF THE LARYNX.

was much infiltrated, and was indeed representative of a typical 'pachydermia.' This tended to considerably diminish the area of the glottis. The *vocal cords* were of greyish and slightly pink tone, and beyond being somewhat obscured by the infiltrated *ventricular bands*, were not themselves much thickened, nor were they ulcerated; but at the position of each *vocal process* a considerable prominence, of the same colour and unbroken surface as the rest of the cords, was to be observed, such as is seen in a trachoma, except that it was symmetrical.

The appearance of the *lingual tonsil* was peculiar; not only was it pale, firm, and unyielding to the touch, but the separate lymph nodules, instead of being round or oval, were, as it were, crowded together as a mass of longitudinal corrugations. This may be seen at the upper part of the laryngeal picture.

CHAPTER XXVI

MALFORMATIONS AND BENIGN NEOPLASMS OF THE LARYNX

(*Open out* PLATE XIII. *at end of the Book, during perusal of this Chapter*)

NON-NEOPLASTIC MALFORMATIONS.

NO case is on record of *complete deficiency* of the larynx, though cases have been described of a congenitally diminutive larynx, which is invariably associated with a corresponding dwarfing of the trachea and lungs. The subjects of the deformity are generally monorchids; it is also occasionally associated with other developmental defects, such as *coloboma iridis*, *ectopion vesicæ*, etc.

Other **Deformities** of the larynx may be conveniently divided into two main groups—

I. Ante-natal or congenital.
II. Post-natal or acquired.

Of the first, the abnormality may be of the nature of (*a*) *stenosis* or narrowing, and (*b*) a *dilatation* or widening.

I. **Congenital stenosis.**—No specimen of this malformation is to be found in the Museum of the Royal College of Surgeons; and no less an authority than Mr. Bland Sutton assures me that he knows of none, adding that 'the larynx is, of all organs, the least liable to malformation.' Nevertheless it was stated in a recent editorial of *The Lancet*, that 'congenital obstruction of the larynx is neither so rare a disease of childhood, nor of necessity so dangerous, as might be supposed.' When, however, one turns to the literature on which this statement is based, it is found that Dr. Lees, who exhibited a specimen at the Pathological Society in 1883, believed that 'this was the first time that the cause of obstruction'—diagnosed solely by the symptom of inspiratory

stridor—'had been ascertained either by the laryngoscope or by post-mortem examination'; and it is noteworthy that, even in this unique example, death was due to diphtheria. All other evidence is clinical, and the curious assertion is made that 'there is a tendency towards spontaneous disappearance of the stridor,' albeit 'the improvement is associated with persistence of the local constriction.'

It is to be borne in mind that the walls of the laryngeal vestibule are naturally limp and collapsible in the infant, and this fact, coupled with the circumstance that expiratory stridor is but slight or absent, is inconsistent with the existence of an organised constriction.

This falling together of the walls, which represents a **Vestibular stenosis,** is characterised by an excessive curling inwards of the epiglottis, and so close an approximation of the ary-epiglottic folds that the vocal cords and the rest of the interior of the larynx, although healthy, are not seen.

The *voice* is described as normal, and the *stridor* only severe on exertion. It is therefore not improbable that the phenomenon may be due to spasm.

Glottic stenosis of congenital origin is represented by the *laryngeal web*, which may be the outcome either of arrest in development or of inflammation during development. It may be noted that it is not at all unusual to see a patient in whom, at the anterior commissure, there is more or less union of the cords at that situation, giving the appearance of the end of an ellipse (Fig. B) instead of the more ordinary apex or triangle (Fig. A).

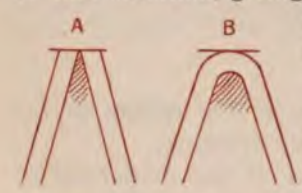


FIG. CCLXXXVI.

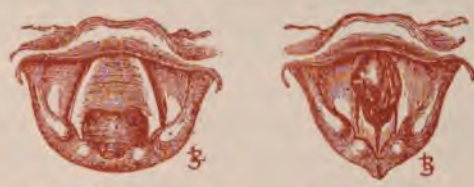
That variety of web which occurs as a *perforated diaphragm* is extremely rare, for such a severe stenosis could not be attended by sufficient expansion of the lungs to give much chance of life, and the condition would be hardly susceptible of recognition at birth. The anterior or ligamentous portion of the glottis is the part which is almost invariably shut off. The web will appear most characteristically when the cords are apart, for, on attempted phonation, its folds may gather up and give the appearance of a neoplasm. The main feature is that the deformity may exist for many years without symptom. I have seen four examples.

One (CASE CXXV.) was that of a young lady, æt. 23, witnessed by me in the practice of Morell Mackenzie. The form of the web on inspiration and its appearance

on vocalisation are illustrated by the annexed drawings (Fig. CCLXXXVII.), which were made by me at that time (1872).

The web was removed at three sittings by means of Mackenzie's cutting forceps, and the patient then, for the first time in her life, spoke in a clear and natural voice. The tissues removed were found to be composed of a stroma of connective tissue, the fibrous bands of which interlaced and crossed each other in various directions; irregularly lobulated papillary outgrowths were also found in the connective tissue.

Two other instances occurred in my practice, which, though similar in the anatomy, each presented very different clinical features.



Respiration. Phonation.

FIG. CCLXXXVII.—CONGENITAL LARYNGEAL WEB.

CASE CXXVI.—A man, æt. 34, was admitted in May 1888 to the Central Throat and Ear Hospital, under my care, complaining of painful deglutition, and alteration of the voice, which had been notably weak since earliest infancy. Nevertheless he had essayed preaching, and after one such effort in the open air the voice had become still more puerile and feeble. Laryngoscopic examination revealed a well-formed semilunar web, occupying a considerable portion of the *anterior commissure*, and connecting the vocal cords, which were highly injected, as was also the rest of the larynx. There was further well-marked granular pharyngitis.

I split the web with my cutting dilator, and four days later, the larynx being restored to its normal calibre, the patient was made an out-patient.

Patency was maintained by the periodical passage of a Schroetter tube for some weeks.

There was no history of syphilis or other illness, and the case was undoubtedly one of a congenital nature, which in all probability would never have come under notice but for the undue call which the patient had made on the voice by his open-air preaching.

CASE CXXVII.—A little girl, æt. 4 years, was admitted into the Central Throat and Ear Hospital in November 1898, suffering with dyspnœa, dysphagia, and cough. The history was that the child had 'never had a proper voice,' but had been able to attend school, where she was reported to be 'quick' in study. Since birth she had snored loudly, and her breathing had at all times been short and difficult. On examination, her tonsils were found to be greatly enlarged, and the laryngoscope revealed a well-marked band in the *anterior commissure*, similar in colour to that of the vocal cords, which were somewhat pink. Her chest expansion was very defective. The voice was reduced to a mere whisper, and she could only swallow semi-solid food, since attempts to take liquids were followed by choking and regurgitation. Seven days after admission she was seized with a sudden attack of dyspnœa, for which intubation was performed. This was followed by complete relief and by increase of chest capacity. Three weeks later the laryngoscope demonstrated that the laryngeal web had entirely disappeared, its position being barely indicated by a slight ulceration of each vocal cord at the *anterior commissure*. Power of phonation was but slowly recovered, but three-and-a-half years later the child was found to speak in a clear, firm, but somewhat low-toned voice. The larynx had remained quite patent, and there had been no return of the respiratory symptoms.

In a fourth case (No. CXXVIII.), a female child, æt. 3, recently under the care of my colleague, Dr. Orwin, it was necessary to perform tracheotomy.

DIAGNOSIS is not difficult when a view can be obtained; the only point is to determine whether the condition has arisen *in utero* or in early infancy, a point of purely academical interest, and not always to be settled by the information to be gained from the parents.

TREATMENT has been indicated in the history of the cases described. As preliminary to direct surgical measures, I should advise the clearing away of all faucial and nasal obstruction; and further procedure, whether of tracheotomy or intubation, with splitting or evulsion and subsequent dilatation, must depend on the nature of the case.

The fact that such a deformity may long exist without developing symptoms of severity, is no reason for not adopting surgical interference, whenever the condition may be revealed, for with a narrowed glottis the patient's life may be at any moment threatened.

Congenital dilatations of the larynx are for the most part pouches or laryngoceles. They may be lateral or median; records are rare, and allusion has already been made to them when treating of the anatomy of the ventricles (page 29).

Morell Mackenzie has recorded a case (No. CXXIX.) of bifurcation of the epiglottis associated with cleft palate, in which there was also in the central line between the arytenoid cartilages, a distinct fissure, which extended downwards on the posterior surface of the cricoid cartilage. The epiglottis formed two flaps which fell into the larynx, and from the first week of life gave rise to constant symptoms of laryngismus, causing death four months later.

It is somewhat difficult to explain the association of the palatal cleft and the bifurcated epiglottis, in this interesting observation, on either a developmental or a morphological basis.

II. **Post-natal** or **acquired deformities** are of the nature of—
(*a*) Stenosis, (*b*) Prolapse, (*c*) Hypertrophy, (*d*) Hyperplasia.

Stenosis may be either traumatic or constitutional. *Traumatic stenosis* is represented by the formation of dense cicatricial webs or bands, following cut throat or the swallowing of hot and caustic fluids. Instead of the stricture being due to the contraction of scar tissue, it may result from exuberant granulations, as in a case related by Sir Charles Bell—that of a girl who died from this cause a few months after a wound in the larynx from a penknife.

Constitutional stenoses are of three kinds—

1. Those formed by interstitial or chronic œdema.
2. Cicatricial or webs.
3. Hyperplasiæ and papillary outgrowths.

All such narrowings may be explained as results of a specific inflammatory process, as, for instance, syphilis, lupus, and leprosy of the dyscrasiæ, or as sequelæ of a specific fever, such as typhoid and small-pox.

Laryngeal prolapse is exhibited as eversion of the ventricle, a condition which is never spontaneous, since it always occurs in association with acute or chronic inflammation, notably that of tubercle, or with some violent respiratory act. A phenomenon simulating eversion is occasionally observed, which, on examination, is found to be due to exaggeration—inflammatory or otherwise—of a 'tongue,' such as is frequently present in the normal sacculus.

Hypertrophies are for the most part due to thickening of the mucous membrane, and are seen (1) in connection with the dyscrasiæ and specific fevers already noted in relation to stenosis; and (2) in chronic laryngitis secondary to nasal obstruction.

Hyperplasiæ are exhibited as—(1) exaggeration of the normal, as in *singers' nodes*; (2) deposit or infiltration of inflammatory tissue, coincidental with or antecedent to more serious changes. This is seen in syphilis and tubercle; (3) a multiplication of the more superficial elements of the mucous membrane, in other words, the condition known as *pacchydermia*.

The following is a recent example in my practice which appears to illustrate a condition on the borderland of an inflammatory hyperplasia and an absolutely new growth. It is interesting also because the histological report so strongly maintained the laryngoscopic diagnosis and the clinical course of the case.

Case CXXX. — Mrs. A., æt. 37, applied at the hospital, July 11, 1898, for treatment on account of hoarseness almost amounting to aphonia and dyspnœa, which had occurred suddenly in connection with a severe cold two years previously. The mirror showed, as dictated to my clinical clerk, 'a larynx nearly filled with myxomatous looking material' (Fig. CCLXXXVIII.). Very small fragments were removed, but the growth disappeared with a rapidity out of all proportion to the amount which was taken from the larynx with the snare; and at the fifth sitting nothing was seen but some slight inflammatory adhesion of the cords at the anterior commissure. A portion removed had the naked-eye appearance of a papilloma; but, examined by Mr. Wingrave, it was found to consist 'of small cell infiltration tissue embedded in a mucoid matrix and covered with squamous stratified epithelium. It is of an inflammatory nature.'

Fig. CCLXXXVIII.

Neoplastic Formations—Benign Growths.

No throat affection has received such an amount of attention since the introduction of the laryngoscope, as has been devoted to new formations in the laryngeal cavity, and the remark of Von Ziemssen, that 'the literature of the laryngoscopic period abounds in recorded observations to a degree almost oppressive,' may be applied especially to this department of laryngology. The reader who would wish for the fullest information as to the earlier history and the almost individually various treatment of laryngeal neoplasms, may be referred to the works of Czermak (1863), Türck (1866), Von Bruns (1868), Gibb (1869), Morell Mackenzie (1871), Mandl (1872), and numerous others, down to Fauvel (1876).

This chapter is confined to discussion of that class of laryngeal growth which may be considered as *benign*—benign, I mean, in a clinical as well as a pathological sense. The principal clinical differentiation is that of non-recurrence, and is for the most part a serviceable one. Nevertheless a small class of laryngeal papillomata exists in which the growths, though truly benign, nevertheless recur. Such are those referred to in this chapter as Cases CXLIII. and CXLIX.; in both, recurrence in a measure only represented further development due to previous imperfect removal. In the second there was also a distinct occurrence in fresh situations. This is characteristic of warts elsewhere.

Etiology.—Hyperæmia being without doubt the most common cause of new formations, everything which tends to excite congestion will naturally predispose to their production. Catarrh, the use of the voice during catarrhal attacks, and certain occupations accompanied by the inspiration of noxious vapours, may all be considered as predisponents of laryngeal growths.

The papilloid formations in tubercular laryngitis can rarely be considered as true tumours, and even those who think otherwise would seldom counsel endo-laryngeal operations for their removal. There can be no doubt, however, that syphilis, predisposing as it does to obstinate catarrhal inflammations, with a great tendency to hyperplastic deposit, does play an important part as a factor in the production, not only of condylomata, but also of true laryngeal neoplasms. The case affording the coloured illustration, Fig. 110, Plate XIII., is one of many in point.

Growths occur usually at middle age, but may arise at an early period of life, or may even be congenital. They are naturally seen more frequently in males than in females.

It is difficult to give any accurate estimate as to the relative

frequency of occurrence of these formations, owing to the fact that doubtless many cases of slight loss of voice, due to the presence of small growths, are not always investigated with the laryngoscope. On the other hand, those engaged in special practice may see a very undue proportion of examples of growth among the throat affections coming under their notice, from the fact that persistent impairment of voice is a symptom for which skilled examination and relief is early sought.

Fauvel 'does not hesitate to proclaim loudly the great frequency of polyps of the larynx,' because he saw 300 cases in fifteen years; but as he does not give the proportion of these cases in relation to all other diseases of the throat which he treated, nor the number of other cases observed in France during the same period, the fact as a statistic is of little value.

Morell Mackenzie saw in ten years over 100 cases; so it is possible, even allowing for the difference of area of France and England, that these growths are more common in the former than in the latter country. If so, a cause may probably be found in the habit that Frenchmen have of speaking always *à haute voix* and in the open air, as well as in the abuse of tobacco, and the taking, by even the temperate, of injurious spirituous drinks, as, for example, the *chasse* of cognac after coffee.

Hospital Statistics show that of all diseases of the larynx treated in a special hospital during a period of ten years—and of those in another for a consecutive period of five years—benign growths occurred in the relation of only 1.25 per cent. From these figures it would appear that benign growths of the larynx are now seen less frequently than they were twenty years ago. To a certain extent this is true, for without doubt those throat ailments which favour the formation of neoplasms now receive earlier and more efficient attention; while facilities for obtaining special treatment are also more widely distributed; and, lastly, though there may not be an actual diminution in the number of laryngeal growths which would formerly have been considered benign, there is, mainly as a result of more thorough histological methods, a greatly increased restriction in the use of the term *innocent* as applied to new growths in all parts of the body, and especially in the larynx. In other words, with an apparent, or it may be actual, diminution in the frequency of *benign* growths, there is a parallel increase—apparent or real—in the numbers of *malignant* formations.

Nasal obstruction is a predisposing cause of laryngeal papillomata which had been generally ignored, but in 1891 an event in my own practice forced it on my attention.

CASE CXXXI.—Miss Estelle ——, æt. 6½, came under my care in September 1890, on the recommendation of Dr. M'Donagh of Toronto. The child had been the subject of husky voice for nine months. Multiple papillomata having been discovered, several pieces had been removed, and prior to leaving Canada for Europe the voice had been restored, and Dr. M'Donagh had demonstrated to the mother that the glottis was free.

FIG. CCLXXXIX.

When I first saw the little patient there were three separate growths, as represented in the accompanying picture (Fig. CCLXXXIX.). These were removed under the partial anæsthesia of chloroform, and the voice was again clear. She then went to Bournemouth, but vocal symptoms returning, together with paroxysmal fits of crying at night, further examination showed a large mass of adenoids. These I removed, and the night following sleep was calm. Six weeks later she returned home. There was a small fragment remaining. An inspection of the larynx in Toronto seven years later (1897) assured me that things had remained *in statu quo*.

Another case, though not so pronounced, gave a similar experience. When one considers the importance of hyperæmia as a factor in the causation of laryngeal growths, and the frequency of laryngeal congestion as a result of mouth breathing, it is reasonable to urge that removal of adenoids should be made preliminary to other measures when they are co-existent with laryngeal papillomata. Nor is the suggestion, that surgical removal of the first may lead to spontaneous disappearance of the second, altogether unwarranted.

The following examples from my note-book illustrate the fact of undue vocal effort and professional voice-use as a factor of importance in the production of neoplasms. To avoid reiteration, they are completed by stating the mode of treatment adopted and the result thereof.

CASE CXXXII.—Miss H. L., æt. 21, residing near Leicester, consulted me on June 21, 1879, on account of a huskiness of the voice, and an occasional discomfort in swallowing, especially hot liquids or *piquant* dishes, of which she partook freely. Her voice had been a fine mezzo-soprano, but had been much tried because she had often sung to excess after a day's hunting, and in other circumstances very unfavourable to it. I found a small cystic growth on the left side of the epiglottis, as indicated in the drawing (Fig. CCXC.). This was at once *incised*, and *caustic applied*. There was also a minute vascular prominence at the free edge of the right cord at its centre. *Applications of mineral astringents* always reduced the small hyperæmic growth on the cord, and gave improvement to the speaking voice; but the singing voice was never restored. I saw this patient occasionally for several years, and observed that the neoplasm remained for the most part in a passive condition: she resigned herself to her discomfort, and did not care to undergo the fatigue of treatment. The growth on the epiglottis quite disappeared after the first incision and cauterisation.

FIG. CCXC.

CASE CXXXIII.—Captain S., æt. 49, who had served in a cavalry regiment for some years in India, but had retired nearly ten years, consulted me on June 4, 1880, on account

of an occasional loss of voice and tickling cough, which had existed for fifteen years. His laryngeal condition was identical with that depicted on Fig. 83, PLATE IX., there being a small vascular polyp attached by a small pedicle to the right cord, which flapped up on phonation. It was quickly removed by the *Sponge probang*, applications of chloride of zinc being made for a few days after, with the result that the cough was entirely removed, and the voice became stronger and more certain.

CASE CXXXIV.—Mr. T. J., æt. 60, formerly a sergeant in the army, and still drill-sergeant to a Volunteer corps, keeping also a public-house, consulted me on June 13, 1879, on account of complete loss of voice for six weeks, with gradually increasing hoarseness for eighteen months. Had not always been temperate, and acknowledged to syphilis in early life. He was admitted into the Central London Throat and Ear Hospital, and after a series of operations, principally with the *snare*, his larynx was cleared of the several growths shown in Fig. CCXCI. But a certain amount of hyperæmia persisted; and his voice, though it remained somewhat gruff, was sufficiently restored to enable him to resume his drill duties.

FIG. CCXCI.

CASE CXXXV.—Mr. C. B. L., æt. 24, a theological student, consulted me, April 25, 1885, by the advice of Mr. Taylor, New College, Oxford, and of Dr. Dyer of Ringwood, on account of loss of voice, the cause for which was plainly apparent in the laryngeal mirror, as shown in the accompanying sketches, Fig. CCXCII. His history was interesting, and to the following effect: As a boy he had sung treble in a school choir up to the age of 15 or 16, singing through the change of his voice in chapel, but discontinuing to take part in the glee club of his school. His voice on settling became baritone. He commenced singing again with Mr. Taylor on going to Oxford, but suffered frequently from hoarseness. His vocal disability had become permanent since the previous Michaelmas Day (September 1884). For some time previously had lost all power of producing soft notes in singing, and in conversation had either to force or to pitch his voice very deeply. The

FIG. CCXCII.

growth was *snared* at the first attempt, and purity and strength of vocal tone quickly followed.

CASE CXXXVI.—E. A. S., æt. 39, a schoolmaster, came under my care July 13, 1885, on the recommendation of the Rev. Henry Arnott, F.R.C.S.

The patient stated that for nine months his voice had been becoming weaker. The loss of power was always greater after his work, and in the evening the voice would be quite lost. He had formerly sung well; but his singing voice had been gone for a year or two, and lately his respiration had become impeded. His father had died of asthma.

I found that his voice was reduced to a hoarse whisper, the cause of which was quickly revealed by use of the laryngoscope (Fig. CCXCIII.).

He was admitted into the hospital on July 20, and at once submitted to operative treatment by the *snare*. On removal of the growths on his vocal cords, it was observed that there were others situated beneath the glottis. These also were removed at subse-

FIG. CCXCIII.

quent sittings, and the patient left the hospital to return to his vocation on August 7. He subsequently informed me that his speaking voice was quite regained, but he has not since been able to sing. A later communication assured me that he continued well.

CASE CXXXVII.—George S., æt 39, a costermonger, applied as out-patient at the hospital on December 3, 1885, on account of complete loss of voice. He stated that his first symptom dated from nine months previously, when he complained of a tickling and burning sensation in the larynx. His *voice* began to 'break' about this time. It gradually became weaker until the date of his application. It was now reduced to the merest whisper. He complained of a slight dry cough, referred to a desire to clear his throat. His *breathing* was somewhat short and laboured when he first woke, and both it and his power of swallowing were worse after use of the voice.

FIG. CCXCIV.

On laryngoscopic examination (Fig. CCXCIV.), a large pendulous and semi-transparent growth was seen to occupy the anterior half of the larynx, and was apparently attached to the left vocal cord.

The patient was demonstrated to my class on that day, and on December 7 it was entirely removed at the first attempt with a *Gibb's snare*. On removal it at once collapsed, and was shown, as had been suspected, to be cystic in character. The contents, which were clear and colourless, were probably serous. The patient at once spoke with phonetic tone, and ten days after, in spite of instructions to the contrary, he resumed his occupation, and commenced to 'call' in the streets. The result was that he presented himself on January 11, 1886, with a congestion of his left cord, and a slight swelling at the point of attachment of the growth. He was admitted an in-patient for a fortnight, so as to give him complete vocal rest. His larynx was touched daily with a solution of

chloride of zinc, and the Leiter cold coil applied. On January 25 he was discharged cured.

CASE CXXXVIII.—Fig. CCXCV. represents the laryngeal condition of a gentleman, Mr. B., æt. 27, who consulted me for loss of voice on December 15, 1885. He dated his trouble from June 8 in that year, when, after coaching his college crew in a boat-race at Oxford, which entailed much shouting from the river bank, he found his voice entirely gone. It had not since returned, but, on the contrary, had steadily deteriorated.

FIG. CCXCV.

Of the eight cases affording coloured illustrations to this work on PLATE XIII., two were hawkers, one a singer, and one an actor. One other case (No. CXLII.), to be reported later in this chapter, arose in a singer; so that of twenty-six cases of which I give notes, thirteen, or just one half, are directly attributable to vocal causes; and this is indeed the usual proportion.

Since this question of voice-use is one of great importance, it is to be noted that in the foregoing cases, taken indiscriminately from my own experience, one or more examples of almost every functional cause of laryngeal irritation are to be found.

Thus, constant use of the voice in close rooms with surrounding noise, as in a schoolmaster, affords one example (Case CXXXVI.); of the same in all conditions of weather, as in hawkers and costermongers, there are three (Case CXXXVII., and those of Figs. 111 and 115, PLATE XIII.); daily use of the voice as a choir singer (Fig. 112); as an actor (Fig. 110); forcing the registers of the voice, as by shouting or singing under adverse conditions, three (Cases CXXXVIII., CXXXII., and CXLII.); military duty, two (Cases CXXXIII. and CXXXIV.); continuing to sing through puberty, one (Case CXXXV.).

These records illustrate more forcibly than any mere abstract dictum, the imperative necessity that exists for laryngoscopic examination in every case of loss of voice that comes under notice, whether or not there appears to be a constitutional or functional explanation, or more directly visible causes in the pharynx, nares, etc.

PATHOLOGY.—The morbid anatomy of benign neoplasms, as applied to the larynx, is very little different from what is known of similar structures generally, and the microscopical features of each variety have been given in relation to new formations in the fauces and pharynx. The distinctions are, indeed, chiefly clinical. It is therefore sufficient to enumerate the principal varieties to be

found in this region in their order of frequency, and, under the head of physical signs, to describe their macroscopic appearances as seen in the laryngeal mirror.

The most common of laryngeal growths are *papillomata* or warty—single and multiple; *fibromata* or fibrous; *fibro-cellular* or true *polypi*; *cystic*; *myxomata* or mucous; *adenomata* or glandular; *lipomata* or fatty; and *angeiomata* or vascular. Not unfrequently more than one variety is found in different sections of a specimen. The first three kinds are the most usual, the others are uncommon, though cystic tumours are by no means so rare as was supposed before the almost simultaneous publication of monographs by Moure and Cervesato. *Ecchondroses* or *ecchondromata* have been also described, but they are usually outgrowths from the cartilages, and of a different character from those intra-laryngeal neoplasms which take their origin in the soft parts, and are under our present consideration.

The most frequent situation for growths is on the vocal cords, and they are indifferently found on the superior, inferior, and free borders. In fully 12 per cent. the exact site is at the anterior third; and although it may be only a coincidence, my experience testifies to a preference for the growth to spring from the right side. The character of neoplasms attached to the vocal ligaments is that of the first five varieties; the cause is chiefly vocal abuse, and a constitutional dyscrasia is by no means a necessary or usual predisponent. The contrary of this last condition obtains with regard to formations in the posterior commissure; growths in this position are rarely exhibited in a patient free from syphilitic or tuberculous taint. On the epiglottis the growths are usually cystic or adenomatous. The following is an example of a papilloma in this situation:—

FIG. CCXCVI.

CASE CXXXIX.—Mr. C. H. G., æt. 42, consulted me on January 5, 1882, by the advice of Dr. Scott of Bournemouth, on account of *aphonia*, which had existed for nine months, and supervened on a previous hoarseness of four or five years' duration. There was no *cough* except a slight 'hemming' to clear the throat; nor was there pain or any other symptom. With the laryngoscope a warty growth was seen to be attached by a small pedicle to the left cord (Fig. CCXCVI.), and another more sessile was situated on the epiglottis. On removal by *snare* and *probang*, both were found to be of the same histological character, and to be of papillary structure.

SYMPTOMS: A. FUNCTIONAL.—Although it is of interest to describe the subjective symptoms that characterise laryngeal

growths, it is to be understood that their frequency and severity vary greatly with the size and situation of the new formation. No diagnosis can be more than tentative which is made by observance of functional signs alone, and though presence of a growth may be suspected, its existence and nature can only be verified by laryngoscopic examination.

Voice is impaired in nine-tenths of the cases under observation, and the alteration may vary from slight hoarseness to complete aphonia, there being a characteristic alteration in vocal tone and power during the utterance of very short sentences. Another vocal peculiarity is that of diplophonia or double voice, to be seen in the cases of small growths; this gives rise to interruption of the cords and division of the glottic chink into two.

Respiration is impeded in about one-third of the cases, and the embarrassment is found to culminate to serious dyspnœa in about 15 per cent.

Cough, when present, may be an indication of the situation of the growth at one of the 'cough-spots' of Stoerck. Very frequently the act simply represents an endeavour to relieve a sense of tickling or of a foreign body. The expectoration is scanty; it sometimes contains traces of blood, and even minute portions of the growth.

Deglutition is rarely affected unless the neoplasm be on the epiglottis, in the hyoid fossa, or bordering on the anterior wall of the pharynx.

Pain is seldom a symptom of benign growths, though the sensation of a desire to get rid of a foreign body is frequently complained of.

B. PHYSICAL.—Physical characters as to colour, form, and texture will vary not only according to the position, but also with the pathological varieties of the growth.

Examination of the various figures in PLATE XIII., and the drawings in the text, will show the characteristic laryngoscopic appearances and the most usual position of those growths which are more commonly witnessed.

Papillomata are to be seen in Figs. 110, 111, 113, and 114 of PLATE XIII., as more or less pink, grey, or white excrescences, with a cauliflower-like or truly warty surface. They vary in size from that of a small pea to dimensions which may obscure the glottic lumen. They may be sessile or pedunculated.

Fibromata (Fig. 115) are generally hard, but their consistence varies considerably, and they are usually sessile and of even contour; but occasionally the surface is somewhat rough.

Fibro-cellular growths or true *polypi*, sometimes called soft fibromata (Figs. 109, 112, and 114), are usually small, and are smooth, red, and semi-transparent.

Cystic growths, not given in colour, but shown in outline in illustration of Cases CXXXII. and CXXXVII., are most common on the epiglottis, where they may attain a considerable size, and are generally of the nature of retention cysts. Their colour in this situation partakes of that of the cartilage with somewhat increased hyperæmia.

Myxomata are comparatively rare; they are pinker and more translucent than papillomata.

Adenomata (Fig. 116) are also rare; they are generally seen to grow from the epiglottis, and give the appearance of a more solid structure than a cyst. Their surface is mamillated.

Angeiomata or vascular tumours used to be considered very uncommon, and Morell Mackenzie only related one example, which is indeed doubtful, for it is represented in the illustration drawn by myself as a dark purple growth of mulberry form and colour (Fig. CCXCVII.).

FIG. CCXCVII.—ANGEIOMA OF LARYNX.

I am now inclined to think that it was an example of *laryngitis varicosa*, as described by Lewin, especially as it occupied the hyoid fossa, the site especially emphasised upon by that observer for exhibition of this lesion.

Angeiomata, as I have observed them—and I have seen three examples—have this feature of surface peculiarity, that they may vary at different times from white or pink to a florid red.

Histologically they consist of cavernated connective tissue, the channels being lined with a single layer of epithelioid cells. These vascular spaces may be empty, or filled with laminated clot, as in Fig. CCXCVIII. The surface partakes of the epithelium of the part, but may be sometimes laminated from friction. The stroma may undergo mucoid degeneration, giving the growth a mixed character.

The following is an example of this variety of growth which occurred in my own practice:—

CASE CL.—A gentleman, æt. 40, came under my care in May 1891, on account of hoarseness and vocal fatigue of two and a half years' duration. His symptoms were attributed to exposure to fog. The *laryngoscopic* appearance when first seen was that of a papilloma; it was situated at the anterior commissure. It was removed by a Gibb's snare at the first attempt; the result was a prompt restoration of voice, and there has been no recurrence.

The *histological* features of the removed portion conformed with those just described as characteristic of a thrombosed angeioma (Figs. CCXCVIII. and CCXCIX.).

Employment of the **laryngeal sound** as an aid to diagnosis of the situation or attachments of growths is not called for, since variations of movement and extent of pedicle can be readily seen in the mirror. Nor is external palpation or auscultation of the larynx of any diagnostic value whatever.

C. MISCELLANEOUS.—In truly benign formations, there is seldom any external evidence of the disease, nor does the general health often suffer, unless respiration or deglutition are seriously interfered with.

TREATMENT.—As before hinted, the treatment of such cases can only be undertaken by those having competent experience

FIG. CCXCVIII.—ANGEIOMA OF THE LARYNX (2 *in. Obj.*).

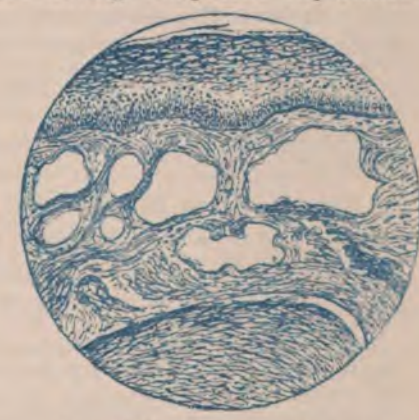


FIG. CCXCIX.—ANGEIOMA OF THE LARYNX ($\frac{1}{8}$ *in. Obj.*).

both in examination and manipulation with the laryngoscope, and notwithstanding that familiarity with the use of this instrument is each year becoming more general, the family practitioner will rarely be disposed to proceed with a case beyond inspection.

The considerations which should guide the surgeon who undertakes treatment of this class of case were brought under the notice of the profession by me in a paper read before the Medical Society of London in 1875, and it was reprinted entire in my earlier editions.

The propositions I submitted for consideration were the following:—

'1. Attempts at removal of growths from within the larynx are not in themselves so innocuous as is generally believed, but, on the contrary, direct injury of healthy parts of the larynx, leading to even fatal results, is by no means of unfrequent occurrence.'

Of this several examples were given. The risks may be avoided by the use of guarded instruments.

'2. The functional symptoms occasioned by benign growths in the larynx are in a large proportion of cases not sufficiently grave to warrant instrumental interference.' On this point I am willing to admit that I may have underrated the inconvenience, professionally and socially, of mere loss of voice; but I still submit that it is not sufficient to warrant operations which are in any sense dangerous to life. The truth of this and of the next proposition has indeed been conceded by Morell Mackenzie in the following words:—

'There are a few cases in which operative procedure is not required. Thus small growths in the epiglottis or ventricular bands, which cause little or no inconvenience, may well be left alone. This remark especially applies to fibromata, which grow much less quickly, and are more frequently arrested in their development, than other growths. In these cases, all that is necessary is to make a periodical examination of the larynx, once or twice a year, to see that the neoplasm does not increase in size. Further, it sometimes happens that where, in consequence of the advanced age or occupation of the patient, the voice is of little importance, no treatment need be adopted unless the respiration be also affected.'

Reference may here be made to the after-history of a case of which I had personal knowledge from its first presentment. It is recorded as No. XCIX., p. 197, in Morell Mackenzie's classical essay on 'Growths in the Larynx':—

CASE CXLI. — The patient, Mr. L. T., æt. 27, was the son of a medical practitioner, and came under notice in May 1870 on account of simple hoarseness which had existed two years. The cause for this was found to be 'a very large pink lobulated growth occupying the anterior three-fourths of the right vocal cord, and in deep

FIG. CCC.

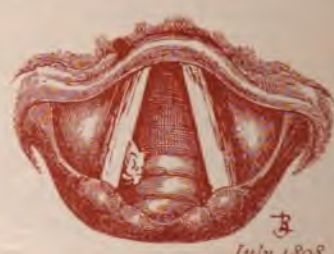


FIG. CCCI.

inspiration projecting across the left vocal cord (Fig. CCC., a facsimile of the original illustration). The whole of the larynx was cleared in a comparatively short space of time, with the exception of one piece under the right vocal cord. But the voice having been completely restored, Mackenzie thought it wiser to desist from further efforts, the patient being instructed to present himself for inspection once or twice a year. This he did from the year 1871 until the death of Mackenzie in 1892, since which time he has paid similar visits to me. The condition of the larynx at present is as indicated in the second illustration (Fig. CCCI.). The voice is perfectly clear, and the patient, who

is in robust health, has never suffered in the least degree during the twenty-eight years that have elapsed since active treatment was concluded.

The number of persons to whom the advice (appropriate to those subject to benign growths in other regions of the body) to watch and wait is given, must be very small; but without doubt there are a very large proportion of cases which never require treatment, and, if left to themselves, never assume a serious aspect. There is no reason to doubt that, while many of these formations remain thus stagnant, a large proportion would, on no less authority than that of Virchow, if untreated, 'frequently disappear spontaneously, being subject, as they are, to slow atrophy and resorption.'

'3. Many of these new formations will disappear, or be reduced by appropriate local and constitutional medical treatment, especially when of recent occurrence.' The following is an interesting example out of many I have seen of a distinct cure of small growths by early local treatment:—

CASE CXLII.—Miss T., a student of singing, æt. 19, had for three months lost her singing voice, and for two months had been distinctly hoarse in ordinary conversation. The condition, as seen with the laryngoscope at her first visit, February 3, 1875, is represented on Fig. CCCII., namely, a small growth on the left vocal cord, surrounded by bright red localised congestion. After a week's daily application of a solution of chloride of zinc, the hyperæmia was removed. In a month she was quite well. Often seen afterwards at frequent long intervals, her voice remained perfectly clear.

FIG. CCCII.

'4. Recurrence of laryngeal growths after removal *per vias naturales* is much more frequent than is generally supposed.' Doubtless this is sometimes due, as in the two following cases, CXLIII. and CXLIV., to incomplete removal in the first instance, but in others from irritation of a mucous membrane having a neoplastic proclivity. Case CXLIX. illustrates both these points, and the experience of every practitioner would afford others.

CASE CXLIII.—Mr. T. F., a baker, first seen on October 22, 1877, stating that his voice had been always rather thick, having as a boy suffered from enlarged tonsils. He had within the last twelve months become hoarse, and was now almost voiceless. Until three or four weeks previously he had been for some months under the care of another practitioner, who had on eleven different occasions removed pieces of growth, and at the last two or three sittings he had informed the patient that there was the merest fragment left. There is not the slightest suggestion that the practitioner stated other than the truth; but it should be mentioned that all this information was not communicated by the patient until after he had been examined and a sketch made of his case (Fig. CCCIII.), when

FIG. CCCIII.

he exclaimed, 'Why, that is just like the drawing made before I was ever operated upon.' Regarding what was just now said as to constitutional treatment in these cases, it may be stated that this patient had contracted primary syphillis six years previously, followed by sore throat and skin eruption, and was, when first seen, suffering from palmar psoriasis. He had, however, received no medical treatment whatever from his former attendant, who told him that the eruption on his skin had no more to do with his throat than would a broken leg. Mr. Durham, who saw the case in consultation with me, aptly retorted, 'But you would think a broken leg had something to do with your throat if you had hurt both with one and the same accident.'

Case CXLIV.—Walter L., a hairdresser, æt. 19, first seen on the 3rd of March 1876 at the Central London Throat and Ear Hospital. He stated that he had always been subject to catarrh, and, having lost his voice during an attack two years previously, had never since recovered it. He had attended for nearly a year at the German Hospital, and only on his last visit had been examined with the laryngoscope. He had then attended another (special) hospital, where, after removal of his uvula, pieces of growth were evulsed from his larynx on four different occasions, at intervals of from seven to ten weeks. The largest piece was that last removed. He stated that his voice was now worse than before any operation at all, but that lately his breathing had become laboured. He gave as his reason for discontinuing attendance at this last institution, that he did not see what was the use of these operations if the tumours grew larger at each interval. Laryngoscopic examination showed two pink lobulated and symmetrical growths on the vocal cords at their anterior insertion (Fig. CCCIV.). There was great thickening and irritability of the pharynx; the larynx was also extremely congested, and it was difficult to make even an ordinary examination. Although, therefore, this case is brought forward to show the strong tendency to fresh growth, even while under treatment, the fact that any growth at all had been removed reflects the greatest credit on the skill of the practitioner under whose care this patient had been.

Fig. CCCIV.

It is worthy of remark that where there is a tendency to fresh growth in another part of the larynx, or to recurrence in the original situation of the first formation, and repetition of operative procedures is made, the intervals between each successive recurrence almost invariably become shorter. This is only what takes place in recurrence of tumours in other parts of the body.

Here might perhaps be noted a reason for early removal of papillomata, on the ground that warts are infective. On the other hand, the possibility that re-implantation may occur as a result of removal might be urged in favour of an attitude of inactivity.

'5. While primary malignant or cancerous growths are of rare occurrence within the larynx itself, benign growths occasionally assume a malignant and even cancerous character by the irritation produced by attempts at removal.' This remark is the one which, above all others, has met with most opposition. It has, however, received support from Solis Cohen, Tauber, and others, and notably in the history of one of the patients from whom the late Dr. Foulis excised the larynx.

The primary growth was a papilloma, and was removed by Dr. Morell Mackenzie about five years previous to the time that he came under Dr. Foulis's care; the papilloma was followed by the epithelioma, which was intrinsic. and the specimen is preserved in the museum of the Glasgow Royal Infirmary.

This proposition, in recent times, received also the support of Schnitzler, but, on the other hand, it has been met with energetic opposition from Semon, who adopted the plan of collective investigation, with the result that of 8216 cases of benign papillomata submitted to treatment, an apparent transformation from benign into malignant growths is acknowledged to have been noticed in thirty-two instances, or one in every 257 cases; but only sixteen are admitted as certain, which gives one in every 513 cases. I cannot agree with the author's conclusions, that 'it must be at once admitted that if the operation had any appreciable influence in modifying the nature of the neoplasm, the proportion of cases in which it would be observed would be much greater than this.' Nor can I admit that my suggestion 'would do much to show that Von Bruns' introduction of intra-laryngeal operations for tumours was not the great improvement it has been held to be—but, on the contrary, a very mischievous procedure.' For, with regard to the first proposition, a fallacy is likely to occur, and this in two directions—(*a*) Because it is quite possible, and even probable, that where cases believed to be benign have afterwards turned out to be malignant, the operators have returned them under the latter heading; and (*b*) because admission to Semon's list was only given to cases that had been submitted to microscopical examination; but it should be borne in mind that in a fair majority of supposed benign cases no such examination is made until malignity is suspected, and not till then is the aid of the microscope called in to confirm or dismiss a doubt.

As to the second point, I do not understand why the law of possible conversion, by irritation, of a benign into a malignant growth should not be admitted as readily in the larynx as in other regions of the body—in the nose, for instance, where examples are by no means rare; nor why the chance of such an eventuality should be held to be criminal in intra-laryngeal surgery by exception.

On the whole, while I am prepared to admit that my experience, which was not derived solely, or indeed mainly, from my own practice, may have been exceptionally unfortunate, I shall never regret that I brought the question under the notice of the profession.

'6. The instruments most generally now in use are far more dangerous than those formerly employed.' On this point the reader is referred back to page 170 *et seq.* for information

as to the instruments which are now recommended and employed.

'7, and lastly. The cardinal law, that "an extra-laryngeal method ought never to be adopted unless there be danger to life from suffocation or dysphagia," should be applied with equal force to intra-laryngeal operations; and it is a subject worthy of consideration whether, in many cases, tracheotomy alone might not be more frequently performed—*a*, with a view of placing the patient in safety where dangerous symptoms are present; *b*, in order that the larynx may have complete functional rest; and, *c*, as a preliminary to further treatment, radical or palliative.'

If the previous propositions be accepted, there is not much necessity for enlarging on this one. It is only necessary once more to impress the importance of a more general study of the laryngoscope, and of its use at an early stage in every case of alteration of voice; of the prompt and effectual relief of nasal obstruction; of the early treatment of hyperæmia of the larynx, so frequent a sequel of the last-named condition, remembering also that hyperæmia is the most general forerunner of growths; of the early and active local application of topical astringent applications to such new formations; of the administration of suitable medicinal remedies when there is evidence or presumption of any constitutional cause or complication; and of the non-instrumental interference with these formations for mere symptoms of inconvenience, or at least the avoidance of unguarded forceps—whether for 'evulsion' or 'crushing'—of scissors, or of knives, having always in view the dangers they may inflict on healthy structures, and the fear that traumatic irritation may make the disease worse rather than better.

Surgical treatment being decided, the following is the course of operative measures to be recommended:—

Education of the larynx, combined with the administration of bromides and the sucking of ice, so often adopted in earlier days, was required in order to overcome reflex sensibility; and, in other circumstances, local anæsthesia, by painting of chloroform and morphia, a tedious and by no means always an innocuous procedure, are all now unnecessary. Having decided to remove a growth, cocaine is first applied by means of a cotton-wool brush to the fauces, and, by a spray, to the larynx, directed by the mirror.

Experience seems to show that it is better to make two or three repeated applications, at intervals of six or eight minutes, of a 5 or, at most, 10 per cent. solution, than to employ those of greater strength, since these last are sometimes attended with toxic

symptoms. Once or twice, where applications of this nature have not been successful in allaying reflex irritation, I have with advantage injected a small quantity of cocaine into the neighbouring tissues. Local anæsthesia being thus obtained, the patient holds out his tongue with his right hand, and the surgeon, handling the mirror with his left hand, introduces with his right the snare (Fig. CXX. or CXXI.), or the laryngeal sponge probang (Fig. CXXII., pp. 169, 170, and 171), until he *sees* that it has passed the epiglottis; he then, remembering the antero-posterior inversion of the laryngeal image (Figs. LIII. and LIV., pp. 82 and 83), passes the instrument well *forwards*; this is in the contrary direction to what would appear to the unpractised eye to be indicated by the mirror, and it requires some experience to overcome the tendency to pass it backwards. If anæsthesia is not complete, the larynx closes round the instrument the moment it enters the vestibule, and the surgeon will have to trust to his previously ascertained knowledge of the position of the growth as to whether he passes his snare to right or left, to back or front, of the larynx. In many cases there is considerable spasm, which makes it difficult for the instrument to penetrate beneath the glottis, and some amount of force—or, better still, a little patience—is required. I prefer the latter, since force in the case of a snare of fine wire, especially if the loop is large, may bend the loop on itself, and there is really no occasion for hurry; the glottis is sure to open in a second or two, and then this difficulty is overcome. If a growth is situated anteriorly or on either side, I place a finger of my left hand (having withdrawn the mirror so soon as I am sure the instrument is in the larynx) externally in the corresponding situation, so as to give a *point d'appui*. If the growth is situated posteriorly, the patient may be asked to assist by making the act of swallowing. If a loop is used, it is gradually tightened by traction, and withdrawn after the surgeon feels he has placed it in a favourable position for catching the growth; but if the sponge is employed, it may be rubbed up and down several times with considerable firmness. Personally, I generally charge the sponge with a solution of chloride of zinc or sulphate of copper (Form. 65 or 58), or the cocaine solution may be employed to moisten it, with a view of allaying after-pain. On withdrawal of any endo-laryngeal instrument—no matter what the character—spasm often occurs, though this symptom is less marked in the case of instruments incapable of 'nipping' a cord, a cartilage, or a piece of mucous membrane, and its severity is also modified where the cocaine has been previously well applied.

A few whiffs of chloroform, which should always be at hand, or a sip or two of cold water, will usually allay discomfort of this character. It is not well to repeat attempts at removal many times at a single sitting, for the threefold reason that (1) the larynx becomes more sensitive with repeated attempts; (2) spasm is more likely to occur; and (3) there is a risk of setting up inflammation, and possibly œdema. Moreover, the moral effect of repeatedly unsuccessful attempts is not calculated to improve the chances of a further trial. Should a practitioner attempt to remove a growth according to the foregoing instructions—and everyone must have a beginning—he will not be less likely to be successful by the assurance that, if he does not catch the growth, he will not be likely with these guarded instruments to injure any healthy part. I beg to repeat here what I have previously stated, that since the foundation of the Central London Throat and Ear Hospital in March 1874, neither I nor any of my colleagues, present or past, have ever used an unguarded instrument. But while this is the course of treatment which I personally pursue as the result of a long and extensive experience, supported by that of my colleagues, I am not prepared to deny that brilliant results may be, and are daily, attained by the use of forceps, according to the pattern of Mackenzie, Fauvel, etc. I only think the risk of injury from them is greater than with the snare, and as I have always found the latter in every way efficient, I still continue to employ it almost exclusively.

Several cases have already been recorded in which treatment has been successfully employed on the lines I have indicated, and I now add a few more, simply to show that the milder measures are not less efficacious or rapid than the bolder ones adopted by others.

Case CXLV.—Mr. G. H., æt. 70, first consulted me, June 5, 1879, on account of gradual loss of voice, which had commenced two years previously. The present vocal state was one of almost complete aphonia; no pain was experienced, but great effort was required at every attempt to speak.

Fig. CCCV.

The cause of his condition is shown in Fig. CCCV.

There was a large growth on the edge and upper portion of the anterior two-thirds of the right cord, and a smaller one beneath the same cord at its posterior part.

After consultation with my late colleague, Llewelyn Thomas, he was placed under treatment; by far the larger portion of the growths was removed by the *snare*, and the voice greatly improved in tone and

freedom; but on account of his advanced age, the patient was not inclined to persevere to a complete eradication.

CASE CXLVI.—J. V., æt. 42, a police constable, came under my care at the Central Throat and Ear Hospital, September 13, 1879, on account of loss of voice, which had been gradually increasing since the previous winter, during which he had taken a severe cold after night-duty, and had for some days been completely aphonic.

The cause of his trouble was a papilloma on his right cord (Fig. CCCVI.), which was removed by the *sponge*, and his voice quite restored. I have often seen this man since, and he has had no recurrence.

FIG. CCCVI.

CASE CXLVII.—Mr. E. C. G. T., æt. 52, for many years in the Indian Civil Service, consulted me, in July 1881, for weakness and loss of voice, which had troubled him for two years. He said it was always worse at the end of the day; but he complained of no other trouble. He spoke with the variable tones characteristic of laryngeal growths; and with the laryngoscope, the two small neoplasms, depicted in Fig. CCCVII., were made visible. These were easily rubbed off with a *sponge*, and the voice quite restored.

FIG. CCCVII.

CASE CXLVIII.—Mr. H., æt. 35, of no occupation, consulted me, on November 20, 1882, on account of hoarseness, almost amounting to aphonia, which had steadily increased for two years.

FIG. CCCVIII.

The cause of this condition was a long pendulous growth at the anterior insertion of the cords, and another beneath the left at its posterior portion (Fig. CCCVIII.). After

six operations at short intervals, all was removed by December 12, except the small fragment shown in the sketch of that date; but the patient left town.

He returned on August 27, 1886, with a recurrence in this situation nearly to the extent of the original growth. I was so fortunate as to entirely remove it with a *snare* on the first occasion, and the voice was again restored.

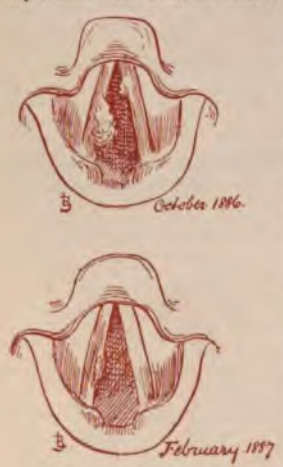
FIGS. CCCIX. AND CCCX.

CASE CXLIX. — Frederick M., æt. 11, first came under my care in the commencement of July 1885, on the recommendation of Mr. Brookhouse of Brockley.

His mother stated that she had noticed a gradual hoarseness for the last eight months. The voice was now reduced to a whisper. There was no other symptom. The laryngoscope showed a large growth hanging down the glottis from its anterior portion. It was difficult to make out its attachments, but it was believed to spring from the right cord (Fig. CCCIX.).

A large piece was removed with the *snare*, and it was then seen that the growth first observed was attached to each cord, and another small sessile one was discovered growing from the edge of the left cord at about its centre. After a series of operations with *snare* and *sponge*, the boy left my care in October with hardly a trace of growth, and with greatly improved voice.

He returned to me on January 26, 1886, with relapse of hoarseness, and it was then seen (Fig. CCCX.) that there was (*a*) a return of the growth on the left cord, (*b*) a subglottic growth *beneath* the anterior insertion, and (*c*) an entirely new growth at the posterior wall, also (very slightly) beneath the level of the cords. Growths were removed on various occasions, and at the end of April he again left my hands with even a better voice than on the former occasion.



FIGS. CCCXI. AND CCCXII.

The boy was again brought to me in October 1886. Again (Fig. CCCXI.) the growth on the left side had returned, but was now more on the superior surface of the cord than formerly, and there was a fresh one rather larger on the upper surface of the right cord. There was no trace of the growths which had formerly existed at the anterior and posterior commissures, and the boy was speaking well. Treatment was resumed, and in March 1887 the larynx was clear, with the exception of a very slight thickening of the right vocal cord (Fig. CCCXII.). *No other instrument except the snare and Voltolini's sponge* was employed, though I was several times tempted to perform thyrotomy, so discouraging was the frequent recurrence, and so difficult were the operations, on account of the small size and, even under cocaine, very sensitive condition of the larynx.

1898: There was no further recurrence.

CASE CL. — Mary E. R., æt. 15, engaged in a factory in Bradford, was admitted to the hospital under my care on December 31, 1885, on account of *complete loss of voice*, but with no other symptom but an occasional (aphonic) cough when tired. The vocal deterioration had been gradual, and was of twelve months' duration. Some recent attempts at removal of the growth had been attended with distress of respiration and pain. These had only lasted a fortnight, and were not present on admission.

The laryngoscopic appearance is indicated in the first of the following sketches (Fig. CCCXIII.).

The growth, which was attached to the right vocal cord, was almost entirely removed by a *snare* at the first attempt on January 2, 1886, and the voice at once restored.

The girl was very talkative, and, moreover, very quarrelsome with the other patients, and passionate; in one of her paroxysms of temper the day after operation, she shouted herself hoarse. On January 4, the larynx generally was somewhat inflamed, and the

FIG. CCCXIII.

cords considerably so. A slough also was observed at the point of former attachment of the growth, but nothing was left which required removal. She was further suffering from acute inflammation of the pharynx and tonsils. She was ordered the cold coil, aconite internally, and frequent steam inhalations. She was also placed in a separate ward, so as to ensure silence. The inflammation soon subsided, and she left the hospital, on February 3, quite cured.

Cystic growths of the larynx, which, as has been remarked, are usually to be found situated on either the lingual or laryngeal aspect of the epiglottis, are best treated by incision, followed by cauterisation, or by the application of the galvano-cautery. Occasionally a cyst may be removed intact by the snare.

Large *adenomatous* growths, and some others of the nature of *sarcomata*, to be considered in the next chapter, may be conveniently and safely removed by Mackenzie's guarded wheel écraseur (Fig. CCCXIV.).

FIG. CCCXIV.—GUARDED WHEEL ÉCRASEUR (MACKENZIE).

The question of **thyrotomy**, or division of the external cartilage of the larynx, has not been discussed. It should not be performed except for relief of vital symptoms, nor until an expert has failed to remove the growth by an endo-laryngeal operation, for it is very rarely indeed that the voice is much better after thyrotomy

than it was before, and the procedure is not without a certain amount of immediate danger to life. Occasionally, however, as in one

CASE (No. CLI.) under my care, in which there was a ridge-like papilloma attached to the whole length of the vocal cord, no intra-laryngeal treatment would be successful. This occurred in a child aged eight, and, as respiration was seriously embarrassed, I performed laryngo-fissure.

Certain foreign practitioners have not hesitated to divide at one operation two or three rings of the trachea, the cricoid cartilage, the crico-thyroid membrane, the thyroid cartilage, the thyro-hyoid membrane, and even the hyoid bone, for removal of a small and non-malignant growth causing but little annoyance; and all this with apparently no thought of such a consequence as perichondritis or caries. In many cases where there is dyspnœa,—the only symptom which appears to warrant interference capable of leading to fatal results,—**tracheotomy**, whether as an only step, or as preliminary to other measures, should much more frequently be adopted.

Tracheotomy is sometimes necessary in *benign neoplasms*, where, the growths being situated on the under-surface of or beneath the vocal cords, attempts at removal set up suffocative spasm. In such a case it is better to perform tracheotomy early and at leisure, after a mild warning, than to have to do so as a matter of urgency. After the operation the growths can not unfrequently be removed from below the glottis through the external tracheal orifice. The operation is also sometimes necessary in a case of multiple congenital papillomata, as a preliminary to thyrotomy or other procedure. Hunter Mackenzie and others have recorded cases in which tracheotomy having been performed on children on account of laryngeal growths, the tube could be permanently removed at the end of a year because the growths had *spontaneously* disappeared. He states, of one case, that 'it is now about six years since the operation was performed, and during the whole of that time there has been no indication of any tendency to recurrence of the growths. The voice is clear, the cords are healthy in colour and outline, the breathing is normal, and the development of the boy is good.' This experience affords a striking example of the advantages of functional rest, and its attainment by tracheotomy.

In performing tracheotomy on account of laryngeal growths in the very young, in whom there is reason to suppose the neoplasm to be congenital, there is a source of danger unnoticed until it was presented to me in my own practice, namely, in—

CASE CLII.—That of a congenital pulmonary atelectasis, in consequence of which the rush of air through the tracheotomy-tube, so much greater in volume than the always feeble current through the narrowed glottis, set up a pulmonary apoplexy, and an even fatal hæmorrhage. In my little patient, aged three, the lungs were found post-mortem to be little larger than those of an infant at birth.

Lastly, with the light of present knowledge, it may be urged that all sources of obstruction to **free nasal respiration** should be searched for, and, if found, should be removed prior to endo-laryngeal or other operative procedures; for several instances, and not alone in my practice, are now on record in which recurrence has only been permanently arrested after removal of naso-pharyngeal hypertrophies.

If the term be limited to carcinoma of this nature, the disease will be found to be much rarer than it is considered even by Fauvel and those authors who have enlarged the limit of primary malignant disease. Butlin's statement that 'intrinsic carcinomas appear to be much more frequent than extrinsic carcinomas' is open to question, and his statistics on this head are misleading; because, rightly enough from his point of view, he limits his consideration to those cases only in which the nature of the disease was confirmed by the microscope. It, however, is hardly necessary to point out that such a test is applied with much more strictness to intra-laryngeal growths—which are otherwise often difficult to diagnose from benign—than to pharyngo-laryngeal

FIG. CCCXV.—STRATIFIED EPITHELIOMA, VERTICAL SECTION ($\frac{1}{2}$ *in. Obj.*).

FIG. CCCXVI.—STRATIFIED EPITHELIOMA, TRANSVERSE SECTION ($\frac{1}{6}$ *in. Obj.*).

carcinoma, in which the physical symptoms are of much more certain significance.

Histo-pathology.—The varieties of malignant disease which attack the larynx are mainly two, viz. (1) epithelial and (2) sarcomatous; of these, the first kind is the more common. In earlier editions I spoke of medullary or encephaloid cancer in the larynx, this variety being recognised by Fauvel, Cohen, and most early laryngologists. This, as well as scirrhus, is also mentioned in the text-books of Bosworth and Gottstein as varieties of malignant disease to be found in the larynx. It is probable that what was formerly called encephaloid would, in most instances, be now described as a small-cell sarcoma, while the so-called scirrhus of the larynx was probably a densely packed spindle-cell sarcoma.

In this situation, as in others, two varieties of the **epithelial type** are to be found, namely :—

1. Squamous epithelioma, or carcinoma plano-cellulare.
2. Alveolar.

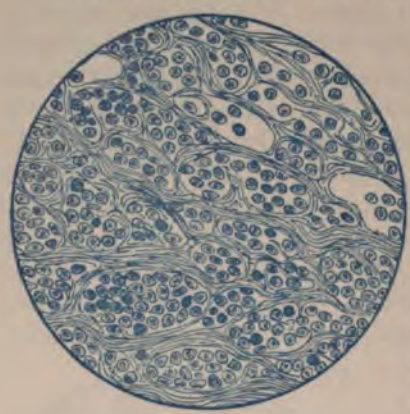


FIG. CCCXVII. — ALVEOLAR EPITHELIOMA ($\frac{1}{8}$ *in Obj.*).

The first-named form does not present in the larynx so much polymorphism as is found in the mouth and fauces. It is generally represented by the nested variety, the epithelial elements growing into the subjacent tissue as solid cylinders (Fig. CCCXV.). These on transverse section exhibit characteristic grouping, known as pearls or nests (Fig. CCCXVI.), even at the most early period of development, a feature which constitutes unmistakable evidence of malignancy. The second or alveolar form is extremely rare, and presents all the characters of an alveolated growth (Fig. CCCXVII.). It generally originates in a pre-existing gland structure, while the squamous starts in stratified epithelium.

FIG. CCCXVIII.—SARCOMA OF THE LARYNX, AS SEEN FROM BEHIND.
(*See* CASE CLXI., p. 692.)

As compared with epitheliomata, sarcomata are rare in the larynx, and especially so as intrinsic neoplasms. Of six cases, seen in my own practice, two commenced in the ary-epiglottic folds, one in the epiglottis, one in the arytenoid cartilages, one from the cricoid, and only one from a vocal cord. It is, however,

extremely difficult to determine, in cases seen in an advanced stage, whether the disease is within or without the laryngeal boundaries. This circumstance is well illustrated by comparison of the accompanying figure (CCCXVIII.), of the appearances in the cadaver, with those seen of the same case during life, as in Fig. 120, PLATE XIII.

Histologically, four varieties of sarcomata are to be found in the larynx—(1) Round cell; (2) spindle cell (Fig. CCCXIX.); (3) chondro-sarcoma; (4) myxo-sarcoma.

Round cell sarcoma is the form most frequently seen. As already described at page 372, it consists of small round cells, embedded in a more or less homogeneous matrix. The other varieties are of the same nature, with the following elements of distinction: — In the second, the cells are fusiform, the nuclei being oval; while in three and four, cartilaginous and mucoid elements respectively predominate.

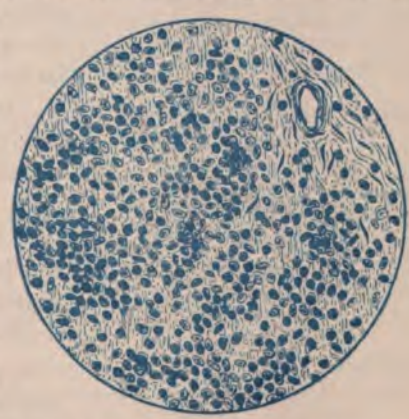


FIG. CCCXIX.—ROUND CELL SARCOMA ($\frac{1}{6}$ *in. Obj.*).

The Lymphatic System in relation to Isolation of Cancer in the Larynx.—To quote Fauvel, it has generally been laid down and accepted, 'that as, on the one hand, larnygeal cancer is not propagated by infection to distant organs, so also cancer, which takes its origin at a distance from the vocal organ, and which in time may be generally developed in other regions, always respects the larynx. It may be said, then, that laryngeal cancer confines and localises itself in the region in which it takes its birth, and that cancerous affection of the immediate vicinity of the organ can alone reach it.' Morell Mackenzie says on this point: 'I only know of one instance in which cancer has developed secondarily in other parts of the body—the original disease having been in the larynx.'

Krishaber has laid it down as a general rule that the extrinsic cancers affect the glands at an early period, and that the intrinsic cancers do not affect the glands. Mackenzie supports this view also, by affirming that 'the external condition of the neck seldom affords any evidence as regards (intra) laryngeal cancer.' I am in entire agreement as to the opinion that laryngeal cancer is never

truly secondary in the sense used by Fauvel and Mackenzie. But clinical observation has had the effect of causing me to doubt for some time past the accuracy of the statements of these authors, regarding the indisposition of cancer of the larynx to infect adjoining glands or distant organs to anything like the extent with which the doctrine is advanced in the words quoted, and by other authors hardly less dogmatically. And this doubt has been strengthened by the fact that until recently I have not found in works on anatomy any explanation in the arrangement of the lymphatics of the larynx, which should satisfactorily account for so anomalous a phenomenon as the isolated existence of cancer when manifested in the larynx.

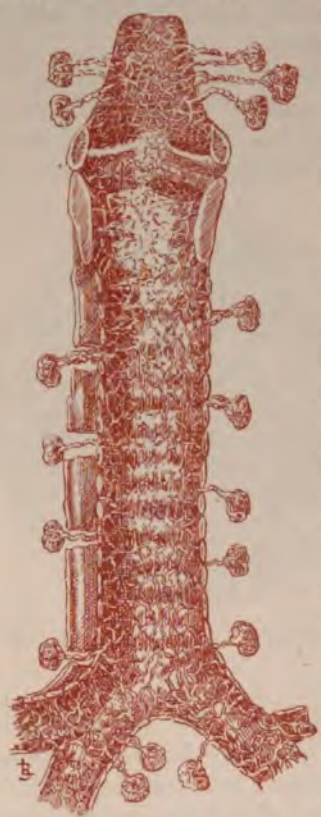


FIG. CCCXX.—LYMPHATICS OF THE LARYNX AND TRACHEA IN THE ADULT (AFTER SAPPEY).

Indeed, text-book information on the subject is very meagre, and is usually limited to a general statement that the lymphatics of the larynx join the deep glands of the neck. But in the work of the distinguished anatomist Sappey, full information is afforded as follows:—

'**Lymphatics of the Larynx and of the Trachea.**—These vessels are remarkable by their number and their development. They are seen to be especially numerous at the level of the upper orifice of the larynx. They spread themselves with extreme abundance over the mucous membrane of the ary-epiglottic folds. They cover also all the surface of the epiglottis, and every other point of the laryngeal mucous membrane, forming, however, in this situation a network many times smaller; this mesh unites into two or three trunks on each side, which pass along the middle portion of the thyro-hyoid membrane, to empty themselves into the group of glands situated to the right and left of the larynx, under the sterno-mastoid muscle (*examine carefully* PLATE XV. *at the end of the Book*).

'The mesh which is to be seen on the mucous membrane of the larynx retains the same character in its course along the whole length of the trachea and bronchi (Fig. CCCXX.). The numerous small vessels which branch off from them at a right angle are almost lost in the glands which are placed on either side, ladder-wise, in relation to these canals.'

No pictorial illustrations of this arrangement were given in the work from which I have quoted, but this deficiency is amply

supplied in the splendid 'Atlas' of the same author, which was only completed in 1885, and from which I have borrowed and adapted the explanatory plate (No. XV.) and the annexed illustration (Fig. CCCXX.).

The following further information is afforded in this last-named volume. We there learn that

'the lymphatics of the air-passages, whether of the superior, middle, or inferior—in other words, of (1) the nasal fossæ; (2) the larynx; or (3) the trachea or bronchi—are more developed in the human species than in any other series of the mammalia; and this is especially true of the supply to the larynx. But there is a general tendency for the lymph system to diminish in the subglottic portions of the larynx, and in its course along the trachea. In the superior orifice of the larynx the vessels are multiplied to infinity, and when the injection is well made, a very rich and elegant network may be seen, which stretches from the median line towards the ary-epiglottic folds. This mesh ascends also towards the free border of the epiglottis, which it covers completely. In some cases it descends over its anterior part, and is prolonged even to the base of the tongue. *Inferiorly* it stretches over the corresponding wall of the vestibule of the larynx to the ventricular bands, becoming more and more attenuated (*en se raréfiant de plus en plus*).

'*Posteriorly*, the network spreads over the ary-epiglottic folds and all the posterior part of the entrance to the larynx, passing from the laryngeal to the pharyngeal mucous membrane. At this point the mucous membrane, which is thin and non-adherent, forms very numerous folds in its reduplications. Hence the mesh acquires a richness and a tenuity which gives it an appearance without analogy in the economy. This excessive multiplicity of lymphatic radicles accounts for the gravity of lymphatic hypertrophies (*angioleucites*) in the superior half of the larynx, of which so little is still known.'

[This fact is interesting in connection with the clinical importance my colleagues and I have for many years attached to enlargement of the lingual tonsil, and of varix at the base of the tongue and epiglottis.]

'In passing from the superior to the inferior half of the laryngeal mucous membrane, the lymphatic system is seen to become abruptly impoverished, and this is more evident with advance of age.'—(See Sappey's 'Atlas,' PLATE XLII., Nos. 5, 6, 7, and 8.)

Sappey adds, however, that the *vocal cords can be injected with success as well as every other subglottic portion of the larynx, but not always without a block.* The lymphatic ducts of the laryngeal mucous membrane are divided into two groups—one on the right side, the other on the left. Each of these comprises four or five vessels, which converge towards the lateral walls of the laryngeal vestibule, and passing outwards in front of the arytenoid cartilages, along and through the thyro-hyoid membrane, to be discharged into the ganglia situated around the bifurcation of the carotid artery. The very minute radicles which flow from the vocal cords are carried, some from within, to empty themselves into the sub-epiglottic mesh; others, from above and without, to be lost in the network on the internal border of the arytenoid cartilages. The twigs proceeding from the subjacent portion of the laryngeal mucous membrane compass the inferior border of the cricoid cartilage. These unite with

those of the trachea, and empty into the very small ganglia which surround the terminal portion of the recurrent nerves.

Regarding the *lymphatics of the trachea and bronchi*, Sappey writes—

'I long believed, and it seemed in effect rational to suppose, that these vessels were more developed in the adult than in the child, and that they were more so in the great divisions of the respiratory ramifications than in the secondary or third divisions. But this opinion was in flagrant opposition to all the results of observation. It is, on the contrary, in the first stages of life that the lymphatic system of the respiratory mucous membrane is seen to be most developed; and it is in the divisions and subdivisions of the windpipe that it attains its greatest importance. Hence diseases of these parts are more frequent and severe during infancy. When one studies the disposition of the lymphatic vessels of the windpipe of an adult, one sees that they are almost wanting at the upper part; but inferiorly, one can inject them at certain points without much difficulty, and thus obtain partial networks of large mesh and of poor appearance, but nevertheless very evident. Their branches empty into the peri-tracheal glands. Lower, at the bifurcation of the bronchi, the meshes are closer, and can be much better penetrated by the injected mercury. At the first bronchial divisions the injection becomes easy. We are thus enabled to recognise that, in the adult, the lymphatic vessels of the air-passages increase both in number and size as they approach the pulmonary lobules, in which they arrive at the perfection of their evolution.'

The connection of these lymphatics with the glands on each side of the trachea has been already described. It is necessary to add that there is a mass of small glands surrounding the recurrent nerve at the union of the trachea and larynx, which may attain considerable enlargement under morbid influences. Finally, these peri-tracheal glands receive the lymphatic discharges of the œsophagus as well as those of the windpipe.

Granted, therefore, that there is some attenuation of the lymphatics in the subglottic portion of the larynx, it cannot be conceded that there is any *isolation*, nor, indeed, is there any clinical experience to indicate that advance of age plays any part in conferring immunity from glandular infiltration, which might perhaps be assumed on anatomical grounds alone.

Sappey's researches further prove that—

'In the newly-born infant, in the first year of life, and during the whole period of adolescence, the lymphatic network of the tongue, palate, tonsils, and commencement of the larynx, as figured in PLATE XV., is continued without attenuation or modification along the whole length of the respiratory passages, so that one can inject without interruption along the whole of the respiratory part, even to the minute divisions of the bronchi. The system is even more developed in the fœtus at term than in the adult. The contrast is above all remarkable in the trachea. . . . This striking difference between the development of the lymphatic system in the child and in the adult is a fact which has hitherto escaped the researches of anatomists, and is deserving not only of their attention, but, above all, that of pathologists. It at once suffices to account for the frequency of diphtheritic affections of the first years of life, and for their rarity with advance of age; it explains also the extreme gravity of these affections.'

This last anatomical fact lends some support to a view on

which I have often insisted, as to the different anatomical characters of all forms of laryngitis in children from what obtains in adults.

It might be added that this circumstance enables us also to understand that the sarcomata or lymphadenomata of the larynx, which are in effect the result of excessive and perverted lymphoid development, are comparatively common in quite young people, although carcinomata, which pathologically may be viewed as detoriations in growth, are for the most part only seen after middle life.

Consideration of the foregoing statements serves to dissipate the contention that the reason why cancer 'respects' the larynx, is the sparcity of lymphatics. We also readily understand, through the knowledge thus obtained and by reference to PLATE XV., why the epiglottis, the ary-epiglottic fold, the hyoid fossa, and the pharyngeal border of the larynx, are such favourite spots for malignant manifestations, and why they are much more rare below the level of the ventricular bands and vocal cords (see also p. 681). But even without the aid of the laryngoscope one may be enabled to estimate the probable seat of a cancer, which is not visible on inspection of the back of the mouth or base of the tongue, by enlargement and induration of this thyro-hyoid group of glands. When the regions just named are attacked, I have found, and should expect to find, that the external condition of the neck *generally* affords this evidence of laryngeal cancer. In such cases, also, the so-called cachexia of malignancy is well marked; but this is not by any means so confirmed when the disease is of the nature of a sarcoma, nor is it so uniform in the rarer circumstance of true cancer arising within the cavity of the lower half of the larynx. In this last class of case the lymphatic infiltration is to be sought lower down in the glands at the side of the trachea and bronchi. Two cases, which I shall presently relate, represent a class by no means uncommon, of secondary deposit in the tracheal and bronchial glands and the apices of the lungs; and I believe that, if searched for after death, this event will be found to be the rule rather than the exception.

It may not always be that the epithelioma is at first visible as an ulceration or actual neoplasm, but if at any time present, it must, from what we know of the flow of the lymphatics, be primary; and I suspect that in many cases of so-called cancer of the bronchial glands, employment of the laryngoscope would prove the lymphatic mischief to be secondary to a laryngeal disease. Nevertheless, on account of the deep-seated situation of these

tracheal and bronchial glands, and the frequent tendency of their overgrowth to develop inwards rather than outwards, presence of such a condition is not always objectively manifested during life, and thus its probability is overlooked. The direct discharge of the lymphatics of the larynx into these tracheal and bronchial glands, will also account for the almost uniform circumstance of paralysis of the vocal cord corresponding to the side of the larynx which is attacked, when the disease is unilateral, —and of both cords in the case of more diffuse intra-laryngeal cancer,—through gland-pressure on the recurrent nerves. I am, indeed, inclined to think that some of the cases of temporary paralysis which one often sees associated with catarrhal inflammation of the larynx, are due to sympathetic enlargement of the tracheal and bronchial glands exerting pressure on the recurrent. That this may be so in cancer is proved in the first of the two following cases. This one also aptly illustrates the fact alluded to by Risdon Bennett, that 'in not a few instances, whilst the intra-thoracic growth is still of limited extent, the symptoms so closely resemble those of aneurysm, as to make the diagnosis extremely difficult and uncertain. The more prominent symptoms are indeed in some instances, and for a long time, mainly cardiac.' Each of the cases also illustrates the accuracy of the statement of the same authority, that 'alterations in the external form of the chest are early manifest in some cases, and not till later in others.' These remarks are taken from Sir Risdon Bennett's contribution to Quain's Dictionary, on 'Morbid Growths of the Mediastinum'; and it will be noticed that they apply equally to carcinoma of the larynx with secondary glandular disease at the root of the neck, and to primary intra-thoracic lymphadenoma.

CASE CLIII.—George W., æt. 60, a horsekeeper, applied at the Central Throat and Ear Hospital on November 27, 1879, on account of difficulty of breathing, which had begun a month previously, and was becoming gradually worse, with, for three weeks, increasing difficulty in swallowing. There was a history of rheumatic fever eighteen years previously, which was uncomplicated, so far as could be ascertained, by any heart trouble. He acknowledged to have indulged in stimulants to excess, and denied recollection of any strain or violent effort. His *voice* was somewhat hoarse and high-pitched; his *laryngeal respiration* was continuously embarrassed, and slightly stridulous. He suffered with a hoarse, hacking *cough*, which was brought on whenever he attempted to swallow, and was accompanied by much thick white glairy mucus. *Dysphagia* was considerable for solids, but fluids were taken with comparative ease. He complained of occasional *pain* in the præcordial region. His radial *pulse* was 84, the left being more feeble and later than the right. The left hand was cold; the left pupil was slightly dilated. His respirations were 18.

With the *laryngoscope* the posterior part of his larynx was noted as hyperæmic, but free from ulceration. The *left vocal* cord was paralysed.

Auscultation gave no evidence of disease in the *right* lung. In the *left* there was slight comparative dulness, with diminished expansion at the apex anteriorly, without any depression. The surface-veins were distended.

The apex of the *heart* was displaced downwards and outwards; valve-sounds normal. A bruit was heard near the cartilage of the first rib, loudest when respiration was arrested.

The dulness below the clavicle, the bruit, the cardiac displacement, the dyspnœa, the laryngeal paralysis, the dysphagia, and the other symptoms—of pulse, etc.—led me to form a diagnosis of aneurysm of the aorta to the left of the middle line; and this was the general opinion of my colleagues.

On December 22, ulceration was observed on the posterior surface of the left arytenoid cartilage, which was also swollen.

On the 1st January 1880, ulceration was noted on the pharyngeal surface of the larynx, and was diagnosed as epitheliomatous. All this time the difficulty in swallowing increased to complete aphagia; and though the patient thought himself better from Chian turpentine, which was at that time being tried, emaciation progressed, and he ultimately died, on May 29, of asthenia.

The *autopsy*, made seventeen hours after death, revealed the fact that *there was no aneurysm*. The *bruit* had probably been caused by a small cancerous gland (examined microscopically), which was situated in the left supra-clavicular fossa, and had pressed on the junction of the subclavian and axillary vessels. A cancerous gland also pressed on the left recurrent nerve, half-way down the neck.

The *pericardium* contained a few ounces of serum. There was a small superficial deposit on the surface of the upper part of the *right lung*, which was almost cartilaginous in density. The lungs were otherwise healthy.

In the *larynx* there was a thick deposit of epithelial cancer on the posterior surface of both arytenoids, also surrounding the *pharynx* in its lower fourth and at its junction with the œsophagus, where the available passage was reduced to about the calibre of a flattened goose-quill.

Case CLIV.—Major ——, æt. 65, sent to me in December 1886, by Surgeon-General Maclean, C.B., who had not, however, been himself in attendance on the patient. He stated that last May he had suddenly lost his voice completely, when apparently quite well. This symptom improved somewhat, though the function was never completely regained. Two months later—namely, in July—he had attacks of coughing and suffocation in attempting to swallow; he 'felt he should choke if he did not get up the morsel of food.' The difficulty was first experienced at the commencement of the gullet, and was not constant or even frequent; but in the autumn he began to feel an obstruction lower down, and the taking of food was now very difficult. Beyond the attacks of choking he had no dyspnœa; but the voice was very characteristic of nerve-pressure, and the cough was also very expressive of that which we recognise as accompanying cancer. He had great trouble from constantly hawking saliva, and had flying pains of great severity about his throat, ears, and chest. He had lost weight considerably. His respiration was noisy at night.

Fig. CCCXXI.

On examination with the *laryngoscope* (Fig. CCCXXI.), the ventricular bands and also the pharyngeal wall of the larynx were seen to be greatly thickened, so that its margin was ill-defined; and there appeared to be bilateral abductor paralysis; but the left cord was not visible, on account of the swelling of the corresponding ventricular band. From its resemblance to many I have seen (note Fig. CCXVII., p. 479), I at first thought the case was one of perichondritis, and doubtless the cartilages were inflamed; but on

examination of the *chest* I found a hard swelling at the sternal end of the clavicle, which I judged to be caused by a growth in the anterior mediastinum. The limit of this tumefaction might he defined by a line drawn from across the right clavicle, at about its inner third, downwards and inwards to the upper border of the third costal cartilage, close to the sternum. There was tubular breathing and dulness—the latter not excessive—over this limited area, not only on the right side, but also on the corresponding portion of the left, which was not swollen. On the left side, however, there was considerable enlargement, without much induration of the glands at the root of the neck. There was tenderness on pressure at the supra-sternal notch, and some (moderate) enlargement in each posterior triangle.

My diagnosis in this case was malignant disease, commencing probably in the larynx, the voice being first affected,—a symptom justly insisted on by Von Ziemssen as of early occurrence, and of great value. Later, the pharyngeal aspect of the cricoid cartilage had been attacked, and hence the choking in swallowing; still later, the intra-thoracic enlargement accounted for the obstruction lower down in the œsophagus.

Subsequent consultations with Dr. Maclean and Dr. Duncan of Croydon confirmed this opinion; the patient rapidly emaciated, losing 3 lb. in weight per week, and died in a few weeks.

Several more or less striking examples of secondary deposits in distant organs of cancer, which commenced within the larynx, have been afforded from time to time. Most of them are collected by Butlin.

Sands reports a case in which the cancer was removed by thyrotomy; the glands of the neck were not affected, nor was there recurrence within the larynx; but after death, which resulted twenty-two months subsequent to the operation, the lumbar glands were enlarged, and the left supra-renal capsule, the left kidney and ureter, were diseased. In a second case, that of Desnos, there was secondary deposit in the liver; and a third, reported by Schiffers, strikingly resembled that of G. W., just related as occurring in my own practice. The glands along the jugular vein were extensively affected, and the lungs contained many secondary nodules, varying in size from a pin-head to a nut. Further cases of secondary infiltration have been recorded by Zeissl, in which the glands at the back of the œsophagus were attacked, and of Von Ziemssen, in which the secondary affection was in the cervical glands.

Butlin, from an elaborate analysis of fifty cases, states that 'Krishaber's statement (as to the non-infecting character of *intrinsic laryngeal cancer*) is not far from the truth,' but there are, as has been seen, so many admitted exceptions to this 'law' as to make it really no law at all; the evidence is, indeed, quite as much in favour of as against glandular infection, and of frequent 'extension of the disease through and beyond the larynx.' This author thinks it 'remarkable that in two of the instances in which dissemination is known to have occurred, the abdominal viscera and not the lungs were affected.' Just noting that I have here reported another case with deposit in the lungs, I would suggest that there is nothing in our knowledge up to the present to justify us in assuming that the abdominal viscera are more frequently attacked than the pulmonary organs. I do not find any circumstance attending cancer in this situation which

should favour its more ready propagation through the circulation, nor is the supposition that cancerous material might readily be taken into the lungs directly through the air-passages very probable, in view of the special duties of the cilia of the bronchi. It is far more likely that in cases of secondary deposit in the lungs, the lymphatics represent the infecting channel.

My own experience leads me also to differ from such an authority as Butlin, in his statement that sarcomas of the larynx do not affect the glands, for in three out of four cases which have occurred in my own practice, and are recorded in this chapter, the opposite condition obtained. Butlin hesitates to accept three other examples of sarcomas infecting the glands, though two of them occurred to so experienced an observer as Fauvel, and the other to Victor Von Bruns. I am, in fact, altogether unable to agree with Mr. Butlin's theory, that 'the obstacle to glandular affection in these cases is mechanical, and that the glands are not affected, simply because the elements of the tumour cannot obtain access to them.' He has admitted previously, that 'in the presence of Sappey's plates' (see PLATE XV.) it can scarcely be maintained that the absence of lymphatic vessels is the reason why sarcomas of the larynx do not affect the glands; and it is somewhat difficult to understand why this 'complete obliteration' of the lymphatic vessels, in the case of a sarcoma of the larynx, should be contradicted in the case of sarcoma of the tonsils, the lymphatics of which discharge into the same group of glands as do those of the supra-glottic larynx.

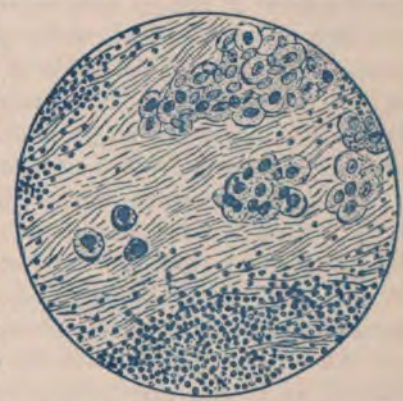


FIG. CCCXXII.—LYMPHATIC GLAND INFECTED WITH EPITHELIOMA (⅛ *in. Obj.*).

Fauvel was the first to draw attention to the remarkable predominance in liability of the left side of the larynx to be attacked by cancer; but I have observed that the same fact obtains in connection with malignant disease of the tonsils, and even with simple inflammations. In 1876 I pointed out also how much more frequently aural hæmatoma are manifested on the left than the right side, and then suggested that this and similar circumstances might be explained by the more direct flow and greater force of the circulation to the left side of the head and neck.

Fig. CCCXXII. illustrates the early deposit of epithelial elements in a lymphatic gland. It will be noticed that the infecting cells are deposited in the lymph vessels of the stroma rather than in the lymphoid tissue, which is involved later on.

ETIOLOGY.—Hereditary predisposition appears to play but a small part in the production of cancer in the pharyngo-larynx.

The great predisposition of the male sex (1 to 10) to this disease would rather point to local irritation of occupation, the habits of smoking and spirit-drinking and syphilis as factors in its production. Professional exercise, over-use, or abuse of the voice does not appear to act to any great extent as a factor of malignant disease in the larynx, common cause as it is for the development of benign neoplasms in this region.

It is probable that, while simple *hyperæmia*, the result of over-use or abuse of the voice, is the main factor in the formation of *benign* growths, *irritation*, independently of any such functional fault—plus a predisposing condition of the nature of which we are ignorant at present—is the cause of *malignancy*.

Whether cancer be dependent on diathetic or irritative causes, it is worthy of consideration if, in the female sex, as has been long suggested, the breast and uterus do not serve as outlets for it, and if its comparatively frequent occurrence in these organs account for its rarity in the pharyngo-laryngeal region.

All observers agree with the experience of Von Ziemssen and Fauvel as to the preponderating frequency of the ventricle and superior surface of the vocal cords as sites of origin of *intra-laryngeal epithelioma*. The prevalence of acino-tubular glands in the ventricle, and the stratified character of the epithelium of the vocal cord (see Fig. XIII., p. 28), offer a probable explanation of the variations in character of carcinoma as it occurs in this region.

Cases have been recorded, one especially by Blanc of Lyons, in his very complete monograph on 'Primary Cancer of the Larynx,' in which the disease was clearly traceable to traumatic causes,—a possibility to which attention has already been drawn as likely to result from the irritation of the larynx caused by attempts at forcible removal of benign growths (p. 662). I shall presently relate a case in which ears of barley were spontaneously assigned as the exciting cause of a sarcoma; but here equally with a carcinoma, and quite irrespective of situation, there must always be, I imagine, a previous change of structure which has predisposed to the malignancy.

Cancer occurs for the most part between the ages of 35 and 65, but sarcomata are comparatively common in early life. The following account of the last-named disease in a child contains several features of interest which justify its relation. For information after the patient ceased to be under my care, I am indebted to Dr. Leslie Ogilvie:—

CASE CLV.—Walter E., æt. 9, was admitted to the Central Throat and Ear Hospital under my care, January 4, 1883, suffering from dyspnœa with stridor, but without dysphagia or loss of voice. This condition had only existed for a few weeks, but had rapidly become serious. His past history was good, and, with the exception of whooping-cough and measles, his health had been fair. The family history indicated a tuberculous tendency or actual death from phthisis in several members. He was a pale, anxious-looking boy. When awake, his respiration was fairly easy and tranquil, but during sleep inspiration was very prolonged, harsh, and breezy. Sleep was disturbed every few minutes or so by difficulty of aeration. Respiratory rhythm was moreover very unequal.

On examination of the larynx (Fig. CCCXXIII.), an oval swelling was observed on the right pharyngeal border of the larynx, with some œdematous swelling of the ary-epiglottic folds of that side. The cords acted fairly well, but were somewhat imperfectly abducted. Externally, a tumour about the size of a bantam's egg could be detected; it corresponded to the swelling seen in the mirror. To touch, the enlargement was elastic and almost fluctuating, and in the belief that it was an abscess an incision was made. No pus escaped, but the swelling was much reduced, and his breathing was improved. It, however, rapidly redeveloped, and a piece as large as a walnut was removed by means of the wheel écraseur. Under the microscope, the structure was that of a round-celled sarcoma.

FIG. CCCXXIII.

Shortly afterwards, the patient was removed from the hospital, and would have been lost sight of, but, through the kindness of Dr. Leslie Ogilvie, under whose care he came in May 1884, at the Paddington Hospital for Children, I am enabled to complete his history. At this date the growth had considerably increased, and, as judged externally, had a diameter, both vertical and horizontal, of 2½ inches. It was irregular in outline, fairly resistant to touch, and painless. Within the larynx the tumour was seen to have displaced the larynx, and to compress the trachea; there were also observed several pendulous growths. Dyspnœa was exceedingly severe, and during night the respiration was of the noisy character that marks bilateral paralysis of abduction. Shortly after admission, tracheotomy was called for urgently on account of spasm. The little patient survived some months, and ultimately died of asthenia on July 16, 1885. Examination of the parts removed on autopsy showed that there was one large tumour 4 inches in length and 3 in diameter, and several smaller ones, which had compressed both the trachea and gullet along their whole course in the neck.

SYMPTOMS.—Both subjective and objective evidence of malignant disease will naturally vary according to the part first attacked. When malignant ulceration commences at the base of the tongue, at the epiglottis, in the hyoid fossa, in the pharyngeal aspect of the ary-epiglottic folds, or on the posterior wall of the larynx, *difficulty of swallowing* will naturally be the first symptom for which relief will be sought. When, on the other hand, the disease commences in the immediate vicinity of the

glottis, the **voice** will be first affected, later the **respiration**, and very little, if any, dysphagia will be experienced.

The same may be said with regard to the physical symptoms, which naturally vary, not only with the origin, but with the variety and with the progress of the malady.

Each symptom will therefore be described separately, according to the point of origin and the variety of the morbid process.

A. FUNCTIONAL.—**Voice.**—*Pharyngo-laryngeal Epithelioma.*—Articulation and speech are characteristically affected, from diminished mobility of the tongue and epiglottis; but vocal changes are not induced until the disease has reached the larynx. This it does either by pushing the arytenoid cartilage of the affected side out of the way, and so mechanically interfering with its action; by infiltration of the intrinsic muscles; by the disease invading the arytenoid or cricoid cartilages; or, lastly, and most usually, by the cancerous mass and accompanying glandular infiltration involving or exerting pressure on the nerve-supply. Whatever the actual cause is, paralysis or impaired mobility of the vocal cord of the affected side, with resulting dysphonia characteristic of such a complication, is an almost invariable symptom of cancer. Actual **aphonia** is rare.

Intra-laryngeal Epithelioma and Sarcoma.—Here hoarseness is the earliest symptom of the disease, and may have existed a very long time before advice will have been sought. In many cases it occurs suddenly. **Complete aphonia** often appears with the advance of the disease, especially in the epithelial variety.

Respiration.—*Pharyngo-laryngeal Epithelioma.*—Embarrassment of the respiration is the first symptom manifested after difficulty of swallowing; and shortness of breath may be noticed even before there is any impediment to the passage of food. If, however, only the lingual surface of the epiglottis is diseased, it is quite possible that there may be no alteration of respiration whatever.

Intra-laryngeal Epithelioma and Sarcoma.—Dyspnœa is a symptom which quickly follows impairment of voice; a peculiarity of the embarrassment is that it is experienced only on exertion, and that comparatively very slight movement will cause shortness of breath, and this even though the disease be limited to one side only of the larynx. From this it is evident that the deeper tissues are very early infiltrated and the muscular fibres weakened. In later stages severe paroxysms of dyspnœa are often experienced, and are due either to pressure directly on the trachea or on the recurrent nerve by enlarged glands, to œdema

of the glottis, or to stenosis of the glottic orifice. In the two latter events, inspiration is much more impeded than ex-spiration.

Cough is not a prominent symptom of either variety of malignant disease, though the usual sensation of a foreign body is experienced, and gives rise to attempts at its expulsion. True cough will, however, be a marked sign when ulceration attacks the region of any 'cough-spot,' or in the event of a paroxysm due to compression of trachea or nerve. The sputa should be carefully examined in a suspected case, since it is not at all uncommon for portions of the malignant growth, especially if it be of the epithelial variety, to be expectorated. Whenever this occurs to any extent, there is always temporary amelioration of the vocal and respiratory embarrassment. Traces of blood are often seen in the expectoration; when the cartilages are affected, the mucus becomes fœtid, and attacks of hæmorrhage may be frequent, severe, or even fatal.

Deglutition.—*Pharyngo-laryngeal Epithelioma.*—As already suggested, difficulty of swallowing is naturally the first and the most prominent symptom when the disease commences in this region, and it is astonishing how soon there will be dysphagia, with but very slight physical evidence of the disease.

In one CASE (CLVI.), a patient of Mr. Furley, then of West Malling, and seen in 1871, I was enabled to diagnose carcinoma before there was any loss of tissue or the least obstruction to the passage of the largest bougie, but only a small spot of limited submucous congestion on the pharyngeal surface of the posterior wall of the larynx. The only symptom complained of was that of obstinate dysphagia. Not till a year later was their actual ulceration.

In another CASE (CLVII.), occurring in the spring of 1877, in which I had the advantage of a consultation with Mr. Callender, there was the same unique symptom accompanied by emaciation; the only physical evidence was very slight ulceration of the free edges of the epiglottis, without any thickening whatever, though there was some external glandular infiltration.

Had the ulceration been of syphilitic or any other non-malignant nature, the symptoms occasioned thereby would hardly have been noticed. There can therefore be little doubt that there is enfeeblement of the constrictor muscles at a very early stage of the disease.

Difficulty of swallowing is early accompanied by *pain*; deglutition of solids becomes impossible, fluids are ejected, and even the saliva cannot be swallowed, and is seen continually running away at the side of the mouth.

Intra-laryngeal Epithelioma and Sarcoma.—In this form dysphagia occurs only as the disease attacks the pharyngeal boundary,

or mounts towards the epiglottis and its arytenoid connections. It rarely fails, however, to be present, and in process of time it becomes as distressing as when the disease has primarily attacked the alimentary tract.

Pain.—When malignant disease attacks the larynx, the same acute, lancinating, constant pain is present as characterises the existence of the same form of disease in other parts; but it is more severe in *extrinsic* or general *intrinsic* manifestations than in *unilateral* intra-laryngeal cancer. In this last form, and especially when the symptoms are phonatory and respiratory, pain may for a long time be altogether absent. Allusion was made, in describing cancer of the tonsil, to the excruciating pain so often experienced in the ears when the patient attempts even to swallow his saliva, and Von Ziemssen has, with great justice, insisted on the presence of earache as a positive argument in favour of the presence of laryngeal cancer. He 'attributes the pain shooting out to the ear of the affected side, to an irradiation of the irritation caused by the neoplasm in the sensitive fibres of the superior laryngeal nerve upon the auricular branch of the pneumogastric.' To this it may be added, that in certain instances irritation of the inferior laryngeal may give origin to the same symptom.

B. PHYSICAL—*Pharyngo-laryngeal Epithelioma* (Figs. 88, 89, and 90, PLATE IX.) commences with a limited and more or less circumscribed congestion, not differing in appearance from ordinary catarrhal hyperæmia, except in its limit of situation and in the thickening of the submucous tissue: the colour may deepen to quite a purple scarlet before the deposit becomes ulcerated. Ulceration almost always commences at the free edge of the epiglottis, or at the edge of either the glosso-epiglottic or ary-epiglottic ligaments; it quickly descends along the ary-epiglottic folds, always preceded by infiltration; as it comes to the margin of the larynx, the process invades that organ, and at the same time displaces it, but the boundary-line between the two passages is seldom lost. This disfigurement during the early stages of the disease is a strong diagnostic point in its differentiation from syphilis, in which deformity takes place as the result of cicatrisation. There is, of course, never the least attempt at repair in malignant disorder.

Epithelioma does not always commence as an infiltration and proceed to ulceration, but may commence as a new growth of the typical (microscopic) characteristics of a non-ulcerated squamous epithelioma.

CASE CLVIII. is represented in Fig. CCCXXIV.—The disease was seen to commence as a full and irregular outgrowth of bright colour on the right pharyngeal border of the larynx, and so to press on the right arytenoid cartilage (the action of which was paralysed), and against the cricoid. The disease soon extended right across the back wall of the larynx, concealing its posterior border and greatly diminishing the orifice of the gullet. Later, the cartilages underwent carious degeneration.

The patient was a female, æt. 62, who had suffered from difficulty of swallowing for eight months, followed by shortness of breath on very slight exertion, hoarseness, and pain extending to the ears. There was enlargement of the cervical glands on the right side. The patient steadily lost flesh and strength, and, refusing to have tracheotomy performed, died about nine months after the first appearance of the symptoms. This patient was shown at the Pathological Society on February 5, 1878.

FIG. CCCXXIV.

Pharyngo-laryngeal sarcoma is rare, and I can recall but two instances.

The first (CASE CLIX.) came under my notice March 29, 1881. The patient, Mrs. D., a widow, æt. 49, was brought to me by Dr. Stavely King on account of difficulty of swallowing. She complained that the first morsel of solid food always went the wrong way, but there was no difficulty with fluids. She suffered from but slight cough, but was greatly troubled by 'phlegm' of a thick character, which gathered round the upper orifice of the larynx. Three weeks previously she had spat up half a pint of dark blood. Her respiration was very noisy, especially at night. On *laryngoscopic examination* a large nodulated growth, not unlike that illustrated in the previous case, but paler in colour, more prominent, and of apparently firmer consistence, was observed to project from the posterior surface of the cricoid cartilage. The left arytenoid cartilage was also involved, and was entirely hidden from view; both cords were paralysed. There was decided glandular infiltration of the neck, and I thought the case was one of epithelioma. On her second visit, April 29th, exactly a month after the first, the growth was seen to have increased, and she had lost 5 lb. in weight. I removed a large piece with the guarded wheel écraseur, which, on microscopic examination by Dr. Dundas Grant, proved to be a *mix-celled sarcoma*. The removal was very incomplete, and the benefit but temporary. The growth speedily returned to more than its former dimensions, but a proposal to attempt radical removal was declined by the patient, and I heard of her death nine months later.

The second case, under the care of my colleague, Dundas Grant, was exhibited by me at the Medical Society, on March 28, 1887.

CASE CLX.—Edwin L., æt. 28, farm labourer, from near Cambridge, applied in the latter end of February at the Central London Throat and Ear Hospital as an out-patient. He complained of soreness and discomfort in the throat, which had commenced last August, and had slowly increased ever since. This he attributed to the irritation caused by the ears of barley getting into his throat during harvesting, he having particularly noticed the annoyance at the time, and endeavoured to overcome it.

He had suffered occasional pain in the last three weeks only, and that not excessive. The painful spot was at the seat of an enlarged gland at the angle of the jaws. *Deglutition*, although uncomfortable, was not materially affected. The phonetic

character of his *voice* was good, but his articulation was impaired. He had had no dyspnœa. His weight was 9 st. 12 lb. on the day of operation.

On *examination* it was seen that the left tonsil was enormously enlarged, and protruded far across to the right of the middle line (Fig. CCCXXV.). It was divided into two distinct lobes by a deep sulcus, the anterior one being flap-like and less solid. On passing the finger down the throat, the growth was found to involve the lingual tonsil, and to extend downwards between the palato- and glosso-pharyngei muscles as far as the hyoid fossa. A view of the larynx was not possible.

FIG. CCCXXV.—FAUCIAL AND LINGUAL TONSILS BEFORE OPERATION.

After consultation, Dr. Grant, on March 14, removed the growth in the following manner:—Solid cocaine being freely rubbed into the surface, he first applied a wire écraseur; but, on account of the firm attachment of the inferior border of the growth, the loop constantly lost its grip, and only small fragments were caught. A large portion of the remainder was removed with Schutz's antero-posterior forceps, and by Löwenberg's curette, both being instruments usually employed for posterior adenoid growths; and, finally, by the raspatory and finger-nail, till the whole surface was smooth. Cocaine was again applied, and the galvano-cautery freely used. There was but little hæmorrhage.

New growth was observed in a week, and in fourteen days had recurred to the extent indicated in Fig. CCCXXVI. In a laryngoscopic drawing made also on this date

FIG. CCCXXVI.—FAUCES, 14 DAYS AFTER OPERATION.

FIG. CCCXXVII.—LARYNGOSCOPIC VIEW 14 DAYS AFTER OPERATION (SHOWING EXTENSION TO EPIGLOTTIS).

(Fig. CCCXXVII.), it may be seen that the larynx is invaded actually to the extent of the epiglottis; but it does not appear that the left pharyngo-laryngeal wall is involved, although its outline is obscured by the growth projecting across its boundaries. Glandular infiltration is limited to small and moderately hard swelling of one of the thyro-hyoid group of glands.

The nature of the growth was ascertained by microscopical examination of fragments before attempts at more complete removal.

The **Secretion** of the actual ulcers is not plentiful, unless the true cartilages are attacked. There is always, however, even at

an early stage, an excessive accumulation of saliva, which proves a symptom of great inconvenience and even of pain. Whether this is due to imperfect deglutition, to reflex stimulation, or to a cachectic influence, it is somewhat difficult to determine, but it is so constant a feature as to possess considerable diagnostic value.

Physical Appearances.—*Intra-laryngeal Epithelioma* is characterised by the presence of a tumour, ill-defined in form, and seldom circumscribed or pedunculated—otherwise it has at first much the appearance of a benign epithelial formation; the surface is formed by irregular nodules standing out from beneath the mucous covering, and, when proceeding from the vocal cords, the growth is of a white or pale rose-colour, though when situated in other parts its hue may be often deepened. Enlarged experience convinces me that this form of cancer frequently commences in the ventricle, though it may appear in the laryngeal mirror to originate from a cord. The *extent* of the disease is often very difficult to determine with the laryngoscope, which affords a necessarily foreshortened view. This is well illustrated by comparison of the figures of the laryngeal image (No. CCCXXXI., p. 702), and of the removed portion (No. CCCXXXIII., p. 704).

As the disease progresses, the colour always becomes more pronounced, the growth increases in size to even enormous dimensions, and there are various points of ulceration. Still later, the whole mass may have the appearance of one sloughing tumour, from which, if the cartilages have been diseased, there will be abundant purulent secretion.

Laryngeal Sarcoma (Fig. 118, PLATE XIII.).—This form is usually developed in the first instance as a firm, defined, and non-pedunculated tumour, or it may appear as a more or less uniform tumefaction of the soft parts, or as general sub-mucous infiltration; it is generally limited in its origin to one side of the larynx.

Its aspect is usually, except when proceeding from the ventricles or vocal cords, smooth and round; but in these latter situations it may assume the lobulated cauliflower appearance of an epithelial growth. In colour it is generally brighter than the epithelial variety; it is of soft consistence, and of very vascular structure; it is therefore liable to early ulceration, and to frequent hæmorrhages. As in the case of epithelioma, these tumours may attain very great size. On this point of the dimensions of a laryngeal sarcoma, my experience is opposed to that of Cohen and Butlin; but several cases which I have here reported, and many others on record, attest its accuracy.

CASE CLXI.—The patient from whom the specimen which affords the coloured illustration of this form of disease was taken was a female, æt. 47, who came under my hospital care in October 1876. The nature of the malady was diagnosed by means of the laryngoscope fifteen months before death, in January 1878. The first symptoms were hoarseness, and later almost complete aphonia; then dyspnœa, both constant and with paroxysmal exacerbations, but dysphagia was never severe. Pain, extending to the ears, was an early and constant symptom.

The bright red colour and smooth lobulated character of the growth, shown in the coloured illustration, served to well differentiate the disease from epithelioma, which, as just said, when commencing with the larynx, is of a much paler colour and of warty appearance, while, as in the preceding case, when attacking the pharyngo-laryngeal boundary, it commences as an advancing infiltration and ulceration. In sarcoma, ulceration is a late

October 14, 1877.

FIG. CCCXXVIII.

December 6, 1877.

FIG. CCCXXIX.

manifestation. These laryngoscopic features are well illustrated in the two drawings (Figs. CCCXXVIII. and CCCXXIX.); the one taken on first seeing the patient, the second more than a year later, and shortly before death (see also Fig. 120, PLATE XIII.).

Microscopic examination gave clear evidence of the character of the growth, which was exhibited by me at the Pathological Society in February 1878, as a specimen of encephaloid cancer; but, with later knowledge, I have no doubt that it was a sarcoma. The post-mortem examination (Fig. CCCXVIII., p. 674) shows that the disease was much more limited to the right side than appeared on laryngoscopic examination, and at the present time I cannot but regret that an attempt was not made to remove it by excision of the affected half of the larynx.

The *most characteristic physical feature* of malignant disease of the larynx, whatever be its variety, is the great **deformity** caused by the new formation. The tumour not only infiltrates and changes diseased portions, but pushes even healthy structures far out of their normal position, so that, as Blanc has well said, 'at a comparatively early epoch of the malady the alterations of the larynx take forms so diverse, that not only does one cancerous larynx not resemble others, but even the same larynx examined at different periods will often present widely different aspects.'

It is this characteristic displacement which may largely account for the severity of the dyspnœa when the glottic lumen does not appear proportionately narrowed, and this symptom may be more frequently traced to mechanical pressure and to nerve-implication than to actual stenosis.

C. MISCELLANEOUS.—**Externally**, there is very frequently,

but by no means invariably, or in the earlier stages, considerable **glandular infiltration**. In *pharyngo-laryngeal cancer*, this circumstance is of almost constant occurrence, and often proceeds to suppuration; but in *intra-laryngeal* malignant disease, it is sometimes *apparently* absent. Glandular enlargement may then be felt lower down along the windpipe, or at the root of the neck, or there may be dulness over the manubrial area. Even where there is no physical indication of glandular infection during life, the fact is frequently discovered post-mortem; and the same may be said regarding secondary deposits in other organs. In *sarcoma* of the larynx proper, the lymphatics are said to be not involved, and such was the condition in one of the two cases quoted; but when a sarcoma commencing in the tonsils extends to the pharynx and invades the larynx by contiguity, there is no immunity of this character. Of such a variety of sarcoma, I have seen three examples. Sometimes the growth itself may be felt by external palpation, especially when the disease has attacked the thyroid and cricoid cartilages. An instance of this circumstance was related as Case LXXXII., of a malignant enchondroma, which is there described and delineated (Fig. CCXXIII., p. 483). An outbreak of carcinoma through the surface of the integument is rare, but ulceration of enlarged and infiltrated cervical glands occasionally takes place.

Wherever possible, the diagnosis should be completed by the removal and a most careful microscopical examination of a portion of the neoplasm.

The **general** symptoms are those common to the malignant cachexia, aggravated by the position of the growth, and interference with vital functions. Occasionally, however, in the early stages of truly intrinsic epithelioma and of primary sarcoma of the larynx, the functions impaired are respiratory rather than nutritive; as a consequence there may be but little general emaciation.

In Case CLXII., just narrated, of the patient who was under my care in conjunction with Dr. Brown of Kentish Town, it was remarked at the autopsy that the body was even more than usually well nourished, so far as the presence of fat was concerned, though the tissues had the characteristic pale and bloodless appearance generally witnessed in the victims of malignant disease.

PROGNOSIS, COURSE, AND TERMINATION.—Malignant disease of the larynx, if unchecked by operation, is universally fatal; but its course varies considerably, according to its original site and pathological nature. Sarcomata, when intrinsic, perhaps exert the least amount of constitutional cachexia, but when manifested

as an extension from the tonsil, the progress is more rapid, and is associated with marked anæmia. The degree of malignancy of each variety of sarcoma is as in the order in which they have been considered. *Epitheliomata*, whether stratified or alveolar, kill more rapidly than the sarcomata, when once in a state of active development and ulceration; but they would appear in some instances to lie long dormant. They much earlier affect the general health of the patient than do the sarcomata, since they attack the vital mechanisms of respiration and deglutition. It would appear possible, from the result of at least one case (the celebrated one of Bottini), to completely eradicate *sarcoma* by extirpation. In others of a similar pathological nature, comfortable life has been prolonged for some years; but the outlook of such attempts in the case of *epithelioma* is very unfavourable, for however complete may appear the removal, recurrence is sooner or later inevitable. Pharyngo-laryngeal epithelioma, interfering as it does with deglutition and nutrition, is always rapidly fatal in its course, and attempts at eradication are universally ineffectual.

The direct causes of death are much the same as in malignant disease in those situations of the throat previously considered (p. 381), and life may terminate by marasmus or asthenia, asphyxia, or hæmorrhage; or by secondary diseases, as pneumonia; or through perforation of the œsophagus.

TREATMENT.—Remedial measures may be divided into—(1) Medical, (2) surgical, and (3) hygienic.

As to the first, no drug of which there is present knowledge has the least effect on the career of laryngeal malignancy, whatever the circumstances of site or variety, and it is only waste of time to discuss the supposed efficacy of Chian turpentine, mercury, sulphide of calcium, iodoform, or ergot. Constipation is a frequent symptom of cancer in the larynx, as of other regions, and relief of that state by enemata or otherwise should not be neglected. For the alleviation of pain, local applications of solutions or insufflations of iodoform, morphia, or cocaine are to be advocated; while externally belladonna, chloroform, etc., and continuous heat by the warm coil, are each of more or less service in mitigating agony. Lozenges of cocaine, eucaine, morphia, etc., are not of much use in laryngeal disease; but sedative inhalations of benzoin, chloroform, conium, hop, etc., give occasional relief to the inflammation (Form. 27, 28, and 35); detergent and antiseptic gargles, especially when used by the Von Troeltsch method (p. 142), tend to diminish the annoyance

of excessive salivation, and to sweeten the sense of taste and the odour of the breath. Ear-drops of laudanum and belladonna are of great value in diminishing the constant and wearying earache.

One practical point which should never escape the notice of the surgeon, in the treatment of these cases, is reserved for the conclusion of this section, namely, the possibility that, in spite of apparently decided symptoms, both functional and physical, the disease may be due to the syphilitic dyscrasia; and it must still further be remembered that the one does not necessarily exclude the other. It is a good rule, therefore, to give anti-syphilitic remedies, especially iodide of potassium, or preferably of sodium, at the commencement of the treatment; care being taken, however, lest the error be made of mistaking the improvement, which so often occurs in the first few weeks of such a course, for a prognostication of cure. In at least one case, to be presently related, I have seen good results in the way of arresting progress, from the persistent administration of arsenic.

2. **Surgical measures** include—(**A**) Endo-laryngeal attempts at removal; (**B**) endo-laryngeal cauterisations; (**C**) tracheotomy; (**D**) complete extirpation; and (**E**) partial extirpation or resection.

Consideration of the advisability of operative procedures is always sure to be pressed upon the notice of the surgeon, since both the patient and friends are naturally anxious that the obstruction to deglutition should be removed, and that the life-threatening dyspnœa should be relieved. There can be no objection to operative measures, provided it be well understood on both sides that the relief, though it may be considerable, is in all probability but temporary, and that the inevitable termination will only be postponed.

With matured experience of all that may be gained by attempts at radical removal, I now advise a simple policy of *watchful inactivity in patients of advanced years*, where respiration is not seriously embarrassed. The following is a favourable example of this line of treatment:—

CASE CLXIII.—*Intrinsic epithelioma, without external gland infiltration. Complete aphonia, but free respiration. No surgical treatment adopted.*—F. W., male, æt. 66, a science tutor, came under observation on October 26, 1896, on account of loss of blood, which had occurred suddenly two years previously, and had persisted. There was little or no cough, no expectoration, no dyspnœa, no difficulty in swallowing, and no pain, or even discomfort.

On *laryngoscopic examination* (Fig. CCCXXX.), the left vocal cord could not be seen; but the whole of the tissues on the left side were immovable, and presented the

appearance of a large irregular mass of somewhat heightened colour, and with warty surface. The right cord was also involved, but it moved freely. The laryngeal outskirts were much infiltrated. No glands could be detected externally, but there could be felt a slight outward spreading of the left thyroid wing. The family history was good, and there was no evidence of syphilis. Moreover, the patient had been a very temperate man both with regard to stimulants and tobacco. The diagnosis was that of intrinsic epithelioma; but, looking to the age of the patient, I decided not to attempt eradication, nor, in the absence of any vital symptom, was there any call for even tracheotomy.

Fig. CCCXXX.

The only treatment adopted was the internal administration of iron and arsenic, and, later, of arsenic alone.

June 1898. — The present condition of the patient is that the laryngeal growth and infiltration are almost *in statu quo*; there is no ulceration, and there is no symptom of distress. The loss of weight in the twenty months since he came under observation is exactly one stone, which represents but slight emaciation from what is usually observed in carcinoma when it affects the throat.

Independently of any effect of treatment, the cause of this quiescence is probably to be found in the purely intrinsic nature of the disease, and the consequent absence of lymphatic infection. I may add that the diagnosis, amply confirmed as it has been by my colleagues, has been made on purely clinical indications, for to remove a fragment for confirmatory purposes would be almost certain to arouse a latent growth into activity.

The degree of danger involved, as well as the amount of benefit to be expected, from the various operations just mentioned, will now be considered separately.

A. With the view I hold that a latent malignancy may be precipitated into activity through **endo-laryngeal** interference, I cannot counsel attempts at removal, *per vias naturales*, of either a sarcomatous or an epitheliomatous neoplasm, the pathological nature of which has been demonstrated by competent examination of a portion experimentally detached, which must be considered as a justifiable, and indeed indispensable, preliminary to any treatment.

Looking to the natural history of a *sarcoma*, and the decidedly unsatisfactory nature of results to eradicate it by operation from such easily accessible situations as the tonsil, it is not probable that any procedure of the same nature lower down in the throat would be of permanently good effect; and the same objection obtains with even greater force in the case of *epithelioma*. I concur, therefore, in the general scepticism with which reports of 'cures,' resulting from endo-laryngeal operations for malignant disease, are to be regarded. An exception must, however, be made in favour of the brilliant success which rewarded the skill and perseverance of B. Fränkel in the following case :—

The patient, 70 years of age, had a tumour on the right vocal cord, of the size of a bean. This was extirpated by the cautery loop. Microscopically, it proved to be a carcinoma. A year later it recurred, and was again extirpated. During the next three years there were three recurrences, with extirpation after each. A carcinomatous gland of the neck was also removed by Professor Madelung. The patient is now 75 years of age, and for two years the larynx has shown no sign of any neoplasm. The voice is clear and loud.

Such a result is indeed a triumph of intra-laryngeal surgery, and proud would any surgeon be if such a result were to fall to his lot. One can hardly expect that this case will ever be otherwise than unique, or at best of very exceptional rarity.

B. The case just reported might be considered as included in the category of an **endo-laryngeal cauterisation,** but this term I preferably reserve for applications of the galvano-cautery to malignant ulcerations and infiltrations which do not admit of extirpation. Such a procedure has twice been adopted with advantage by me, once in an epitheliomatous ulcer of the epiglottis, and once in a sarcoma, extending to the same region from the tonsil; but my experience leads me to fear that the benefit of such a measure is but temporary. With regard to its adoption for laryngeal disease at a lower level, I may once again quote the concluding remarks of my paper at the International Congress of 1881:—

'While without the galvano-cautery in diseases of the nose, pharynx, mouth, and tongue, I should feel deprived of at least one-half of my power to help the conditions for which I use it, I have a strong conviction that were I to employ it to such regions as the larynx below the epiglottis, to the pharynx below the same level, or to the œsophagus, I should introduce into my practice a new and grave element of danger.'

The employment of any form of caustic, as the traditional nitrate of silver, is futile; while those of a more active character, as chromic acid, or acid nitrate of mercury, are attended by risk out of all proportion to any possible chance of benefit.

Electrolysis, in my hands, has given such favourable evidence of its solvent powers in cases of mesoblastic growths in the palate and fauces, that it is worthy of more extended trial in the larynx, though probably the cases suitable for its application will always be restricted in number.

C. The operation of **tracheotomy** is attended with very considerable prolongation of life, but it is of course only provisional against dyspnœa, and palliative of the same vitally serious symptom. Fauvel's statistics from his own experience of this operation are very valuable; they show that in the most frequent form of malignant disease—epithelioma—the average duration of

life of seven patients on whom *tracheotomy* was performed was *four years*; whereas *six* patients suffering from the same disease, who were *not* submitted to this operation, lived only on an average *twenty-one months*. *Eight tracheotomised* patients, suffering from encephaloid cancer (? sarcoma) of the larynx, lived an average of *three years and nine months*; while seven, *not tracheotomised*, survived on an average *three years*. Looking at the fact that by such an operation the vital symptom of dyspnœa is relieved, and that further measures by galvano-cautery, etc., are rendered more easy and more safe, these figures may be taken as demonstrating, in the words of Fauvel, 'the *utility*, not to say *the necessity, of this operation*.' In one case of intrinsic epithelioma—diagnosed by microscopical examination—under the care of my colleague, Dundas Grant, the patient lived for nearly three years in greatly increased comfort. For some months after the operation she even gained in weight. Such an experience is by no means unique.

An important element in considering the question of any operation on the larynx for malignant disease, is the determination of the importance of the prominent symptom. If the voice only is affected, there is less urgency than when the respiratory mechanism is impaired, when no good purpose is subserved by delay. On the other hand, the extent of the mischief has a direct relation to the symptoms; and if a radical operation is contemplated, the chances of success are naturally greater the earlier it is performed.

In view of the possibility of extension of the disease, tracheotomy, unless made as a preliminary to more radical measures, should be performed as low as possible in the windpipe; for Cohen reports that 'the recurring growth may force its way to the exterior through the wound, or, as he had seen even after a low tracheotomy, it may rupture an intact crico-thyroid membrane, and split the thyroid cartilage to give exit to its outgrowths.' In tracheotomy, as a preliminary to extirpation, the high operation in the second or third rings is preferable.

D. The operation of **complete extirpation of the larynx,** though not for carcinoma, was performed by Patrick Heron Watson of Edinburgh, so far back as 1866, and was not repeated till 1873, when Billroth adopted the same measure for the disease under present consideration. This patient died from recurrence seven months later. Five cases followed, one of which was again under Watson; one (Heine) terminated with recurrence in six months, and all the others in a few days. Then

came the celebrated case of Bottini, who, in 1875, removed the entire larnyx on account of a mixed-cell sarcoma. The patient was alive ten years after the operation, and pursuing his occupation. Since then the operation has been frequently performed, and there are now fully one hundred recorded cases, the statistics of which have been frequently detailed. No one has taken pains to investigate the subject with the thoroughness and completeness of Cohen, and I am much indebted to his latest tables for valuable and recent information.

'From the records referred to, and from study of some of the reports in detail, it appears evident that complete laryngectomy can be performed without sacrifice to life, but that every operation places life in peril; and that a large number of the patients succumb within a period so brief that their early death is attributable to the operation, and to nothing else. Of the deaths reported (to May 1884 ninety-one in all), twenty-six occurred within the first eight days, and five more within the second eight days—more than one-third of all the patients subjected to laryngectomy having thus succumbed within little more than a fortnight. The most usual cause of death in this period is from pneumonia, and the period of danger from this event does not seem to exceed two weeks, unless the conditions are exceptional. This important fortnight of tribulation safely bridged, the life of the patient may be regarded as tolerably secure up to the fourth month. Then death from recurrence begins to be imminent, and, according to circumstances, will take place within an additional period, varying from a few weeks to several months, or to more than a year. Complete laryngectomy involves great risk of death by pneumonia, future respiration through an artificial aperture, temporary nourishment by the stomach-tube, and possibly utter inability to speak without the aid of an artificial substitute for the larynx, adjusted to the tracheal canal.'

I have preferred to quote Cohen's conclusions in place of any of my own, albeit they are identically to the same effect and of long formation, because my well-known views as to undue rashness in endo-laryngeal operations might be held to prejudice my opinions on this question also. When, several years ago, the late Dr. Foulis of Glasgow showed at the Medical Society the patient from whom he had successfully extirpated the whole larynx four months previously, for 'papilloma and spindle-celled sarcoma,' I ventured to express a doubt whether that operation would ever yield beneficial results commensurable with the immediate danger of its performance, the very short extension of life, and the discomfort of an artificial larynx to those who survived long enough to wear one; and I drew attention to the superiority of the statistics of tracheotomy to those of the radical operation. Dr. Foulis's was the eighteenth complete extirpation, and the second which survived more than nine months, for his patient lived a year and a half, and death ultimately resulted from phthisis.

For the honour of British surgery, it is gratifying to be enabled to state that not only was this courageous procedure first adopted by a British surgeon, as already recorded, but that generally the

success in this country has been equal to that of Continental, and especially of German operators. Thus Foulis operated on a second patient in April 1881, who survived *nine months*. In the case of a patient operated on by Whitehead of Manchester in May 1882, that surgeon reports to me that he lost sight of his patient, but that he was well *twelve months* afterwards. Jones, of the same city, had a case in April 1884, which he informs me survived *nine months*; and Newman of Glasgow successfully removed the larynx on February 6, 1886, from a man aged thirty-seven, who in March 1887, *thirteen months* after, is well, and 'able to follow his occupation.'

Since the last edition, the statistics of laryngectomy have considerably improved, thanks mainly to earlier operations, more improved methods of procedure, and the greater observance of antiseptic precautions. Schmiegelow of Copenhagen, writing in April 1897, published a mortality of 21.8 per cent. in a collection of fifty-six cases, by different surgeons. Nevertheless the immediate fatality is still great, and for the most part is due to pneumonia. Nor can it be said of the cases that recover, that prolongation of life is attended with much comfort, still less with sufficient health to gain a livelihood, for there is always the inconvenience of being obliged to wear some form of artificial larynx for purposes of conversation.

It has to be admitted that the operation has been performed in this country, as on the Continent, somewhat unjustifiably, *e.g.*, for cicatricial stenoses and for benign formations; also under very adverse circumstances, and sometimes without the very requisite precaution of a proper tampon-cannula, to prevent passage of blood into the trachea; and even without a preliminary tracheotomy. It has also been performed on more than one occasion, in response to urgent request of the patient, without regard to any abstract question of favourable statistics. But however all these points may be viewed, the general results are so discouraging, that many surgeons who have performed the operation have resolved never to repeat it, while others have adopted measures less hazardous.

E. Of these less dangerous operations, **partial laryngectomy,** in the form of removing a lateral half, stands in the first rank. The risk of pneumonia is less, exposure of the pneumogastric being confined to only one side instead of both; if the raspatory be used for the removal of soft parts, as in my practice, the nerve need not be exposed at all. The danger of pneumonia in its septicæmic form, as a result of blood entering the lower air-

passages, has been still further lessened by introduction of the compressed sponge tampon-cannula, which is an immense advance on the indiarubber inflating tampon-cannula of Trendelenburg. For this improvement—as also, indeed, for general acceptance of the operation—the profession is indebted to Eugene Hahn, who had already great success with complete extirpation, and has since recorded several instances of partial removal with equally happy results. There are now recorded some *thirteen or fourteen* cases, and in only *one* instance has there been an *immediately fatal* result. The operation possesses the following additional advantages: deglutition is not impaired, an artificial larynx is not required,—nor even, after a few days, a tracheotomy-tube,—and a very fair and serviceable voice is generally restored.

Recurrence must, in the nature of things, be always anticipated; and we have yet to see what sort of history cases will have in this respect. So far there is reason to expect that the operation may afford average periods of immunity from recurrence even of the more serious forms of malignant disease, almost, if not quite, equal to those provided by tracheotomy. It is earnestly to be hoped that care will be taken in the selection of subjects for this operation, as otherwise discouragement will be given to its performance where other circumstances would be favourable.

Partial laryngectomy has been advised for unilateral and intra-laryngeal epithelioma, and in recent non-infiltrating sarcoma. It is useless in pharyngo-laryngeal epithelioma, in which the larynx is invaded from the pharynx, and whenever there is implication of the cervical glands and structures adjoining the larynx. It is always possible, if, on division of the thyroid cartilage, the disease is seen to have extended beyond the limits suspected by prior examination, for the surgeon to desist from removal, and to be content with having performed a palliative tracheotomy.

This question—whether intra-laryngeal cancer can be best treated by a palliative tracheotomy, or by attempts at radical extirpation—is still *sub judice*. To arrive at a fair verdict, every case of laryngectomy and thyrotomy should be fully recorded.

The following case in my own practice is here given in detail, because I believe that the difficulties of the operation, and also its immediate dangers, have been largely exaggerated.

I may just say that the special dangers to which I allude are those of hæmorrhage and of secondary pneumonia. The abridged account of the case which follows points out in the most practical way the various steps of the operation, and the special precaution

I adopted to avoid hæmorrhage, the fear of which has been so great that in one case (of complete extirpation) Langenbeck was obliged to tie forty arteries.

CASE CLXIV.—G. W., æt. 61, occupied in a timber-yard, applied at the hospital as an out-patient, on November 1, 1886, on account of hoarseness of voice, and occasional tickling cough, first noticed about two years ago; he had never suffered pain, or anything approaching inconvenience in breathing, except when hurrying to catch a train or omnibus.

The patient was a hale-looking man for his age, 5 feet 6 inches in height, and weighing 166 lb. The laryngoscope showed that, while both vocal cords were congested, the left cord was immobile and ulcerated at its posterior portion. There was at that time but little thickening of the left ventricular band, and of the tissues of the left laryngeal boundary of the pharynx, as is seen by reference to Fig. CCCXXXI., which was drawn six weeks after his first applying at the hospital. There was neither then, nor indeed at any period, involvement of the cervical glands, nor was there any constitutional symptom pointing to malignity. Anti-syphilitic treatment pursued for six weeks failed to arrest the ulceration, and there was decided diminution in weight; for on December 13 he weighed only 160 lb., a loss of 6 lb. in six weeks. It was therefore decided, after consultation with my colleagues, to attempt removal of the diseased half of the larynx; and the patient being admitted to the hospital, December 13, the operation was performed on the 15th.

FIG. CCCXXXI.—LARYNGOSCOPIC APPEARANCE PRIOR TO OPERATION.

The operation, which lasted an hour and a half in all, may be conveniently divided into four stages:

1. A *high tracheotomy* between the second and third rings, and the introduction of Hahn's tampon-cannula, consisting of a tube surrounded by compressed sponge. This was first dipped in a solution of corrosive sublimate (1 in 5000).

2. An *interval* of *twenty minutes* for expansion of the tampon; anæsthesia being maintained by the administration of chloroform through the tracheal tube.

3. *Thyrotomy.*—The median incision was extended from just above the tracheal opening to the lower margin of the hyoid bone, and all the tissues were carefully divided on a director until the thyroid cartilage was reached. The soft parts over the thyroid and cricoid cartilages were rasped sub-perichondrially, the raspatory being kept so close that the perichondrium was literally peeled away from the cartilage, whilst its relation to the superficial soft parts remained undisturbed. The separation was carried back by this means as far as the median line of the boundary between the larynx and pharynx; no scissors, knife, or other instrument than the raspatory was used. A horizontal incision over the hyoid bone, as recommended by Hahn, was not necessary, the vertical one proving amply sufficient, but that of the hyoid attachment of the thyro-hyoid muscle was severed. The much ossified thyroid cartilage was then divided by cutting forceps along its centre; the wings were separated by retractors, and the growth was seen to be confined entirely to the left half of the larynx, which portion it was decided to remove.

4. *Laryngectomy* was affected by (*a*) further careful and thorough separation of the attachments to the pharynx by raspatory, knife-handle, and finger-nail; (*b*) division of the thyro-hyoid membrane as close as possible to its thyroid attachment; (*c*) division of the left superior horn of the thyroid cartilage at its root by cutting pliers; (*d*) division in the median line of the cricoid cartilage, before and behind, with pliers; (*e*) the divided half of the larynx was then separated from the first ring of the trachea, and a few nicks only were necessary to remove it entire.

The following points regarding the operation are worthy of note. Hæmorrhage, the extent of which is usually described as serious, was, in point of fact, quite trifling; only two small vessels required torsion in the second stage of the operation. Not only were no vessels searched for, as recommended by most writers, but none of any size were exposed, this happy circumstance being doubtless due to the use of the raspatory in preference to scalpel or scissors, and also to keeping so close to the cartilage. The soft parts were little disturbed in consequence. I am indebted to Mr. Henry Morris for the hint to adopt this procedure, and to it I attribute a very large measure of the success of the operation in its immediate and subsequent circumstances. The slight oozing which ensued after the removal of the diseased portion of the larynx was checked by a light application of the galvano-cautery along the margin of division. This procedure was also adopted for the purpose of destroying any possible fragments of diseased tissue not removed. The left ary-epiglottic fold was divided close to the cartilage of Wrisberg, and the thyro-hyoid membrane close to its thyroid attachment, with the view of impairing as little as possible the action of the epiglottis. The success of this plan was completely shown in the ease with which deglutition was effected three days later. No spray was used; but antiseptic precautions were adopted by the operator, assistants, and nurses first bathing their hands in a solution of the perchloride of mercury (1 in 5000), and by the cleansing and rinsing of all instruments and sponges in a similar preparation.

The patient made an excellent recovery, and but with one relapse of a few days, due to carelessness of the nurse. He was fed with a tube for the first three days, but seventy-eight hours after the operation the patient was ordered a mutton chop to eat, according to the treatment of Hahn, who, for obvious reasons, recommends solid food as the first to be given by the mouth. On Christmas day, the eleventh from the operation, he had turkey and champagne for dinner, and from that date convalescence was uninterrupted. He 'got up' for the first time on the seventeenth day after operation. The tracheal tube was removed on the twentieth day, that is, on January 3rd. His weight was then 148 lb., being a loss of 12 lb. since the operation.

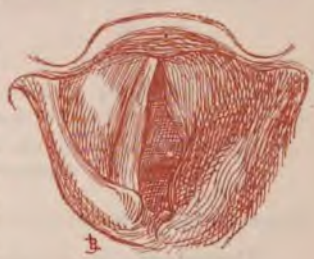


FIG. CCCXXXII. — LARYNGOSCOPIC VIEW, SIXTEEN WEEKS AFTER OPERATION. (April 5, 1887.)

April 5th, that is, the 112th day, wound is healed, and the patient speaks with a wonderfully good though rough voice; it is distinctly phonetic, and he thinks it is at least as good as before the operation. His strength and general health have been well maintained, and he looks and feels well. His weight has not changed since January 3rd. The laryngoscopic appearance at this date is represented in Fig. CXC. The right vocal cord moves freely, but is still somewhat congested; the structures on the left side of the glottis move slightly towards the median line in phonation; the epiglottis acts perfectly, and is not in the least out of position.

P.S.: 1889.—The patient survived thirteen months, and died of a recurrence which necessitated a second tracheotomy.

Examination of the growth, after removal (Fig. CCCXXXIII.), showed it to have sprung from the ventricle, and not from the vocal cord, as had been diagnosed on laryngoscopic examination, in this respect resembling, both in its site and in the misconception, several cases reported by other surgeons. The extent of the disease was far greater than had been suspected prior to operation; this circumstance of the case illustrates the very foreshortened view, with consequently incomplete diagnosis, which may sometimes be obtained by looking into the larynx from above. Generally, the naked-eye evidences were those of epithelioma.

The structure of a superficial unstained shaving, removed for diagnostic purposes, presented the appearance of a typical squamous epithelioma, the nests being remarkably abundant. A later stained and hardened section was made of a portion of the tumour

fissure. In each the recovery of health has been complete, and the patient able to resume his occupation, though in the first of the two, as a matter of precaution, it was recommended that he should not again expose himself to the trying atmospheres of the blast-furnace, and that his orders given as a foreman of a large factory should not be shouted. However, I learn that with confirmation of health these precautions have latterly been to a large extent neglected, and apparently without bad results.

CASE CLXV.—*Laryngo-fissure. Removal of both cords and soft tissues. Recovery, and in good health four years later.*—T. E. B., æt. 45, a foreman engineer in an iron-foundry, was seen by me, in consultation with Dr. Quirke, on June 23, 1894.

History.—He had been hoarse since a severe cold, taken two and a half years previously, viz. at Christmas 1892. In February 1893 he placed himself under the care of a local specialist, who, in the following October, told him he had a small growth on the right vocal cord. This was confirmed by a specialist in London. On his visit to me I found the condition apparent in the accompanying figure (CCCXXXIV.); and I then and there removed a small fragment of growth. This being examined by Mr. Wingrave, was reported malignant.

FIG. CCCXXXIV.

Laryngo-fissure was decided upon, and performed in the usual way, Mr. Carmalt Jones administering the anæsthetic, Mr. Jakins and Dr. Holloway assisting. A Hahn's tampon cannula was employed, and it being seen that the disease was bilateral, both cords and a large portion of the ventricular bands of each side were removed. There was rather free hæmorrhage, but this was without difficulty arrested, and the patient made a good recovery. He left for Bournemouth within three weeks of the operation, and within a further three weeks returned home. His weight, which had been about thirteen stone on admission, had fallen after the operation to eleven stone seven pounds; but in his three weeks at Bournemouth he had come back to twelve stone, but did not resume his duty until the following October.

On March 15, 1896, he wrote that 'my voice has sufficient strength to enable me to perform my duties properly; and as I am now works manager of a large engineering establishment, you may know that I have a good deal of talking, and a considerable amount of it under most unfavourable conditions. My general health is very good, and about a fortnight ago I weighed fourteen stone ten pounds, which is heavier than I ever was before.'

CASE CLXVI.—*Laryngo-fissure and removal of left vocal cord and portion of right, with soft parts of the larynx. Recovery, reconstruction of the vocal cord. In good health with fair voice three years later.*—Mr. Frederick N., an American gentleman from the State of Wisconsin, æt. 50, consulted me on July 4, 1895, by the advice of Dr. Gurnee Fellows of Chicago, on account of loss of voice. This was found to be due to some ulceration in the vocal process of the left vocal cord, and a new growth on the inferior surface, which could only be indistinctly seen. The mobility of the affected cord was but slightly impaired. Fragment was removed by a snare, and submitted to Dr. Galloway for microscopical examination, who reported as follows:—

'The section shows a mass of irregularly arranged epithelium of squamous character, resting on a base of fibrous tissue. Where the exact relations of epithelium and fibrous tissue are visible, the latter is infiltrated with round cell exudation. The epithelium is

arranged in papillomatous processes of very irregular shape and size. The cells show evidences of rapid multiplication, and are arranged within the cores of the papillary processes in the typical "nest-like" form. From the appearances presented, it is evident there is much irregular overgrowth of epithelium. From its arrangement, this cannot be considered to be that of a simple papilloma. On the contrary, the appearances of a squamous cell epithelioma are presented.'

Laryngo-fissure, after a preliminary tracheotomy and the introduction of a Hahn's tube, was performed on July 20, 1895. The left vocal cord was found to be considerably implicated by red warty neoplasm, which did not, however, extend to other tissues, though the left ventricular band was much thickened. The whole of the growth, and a large portion of the full length of the cord, were removed with scissors, as well as the free edge of the ventricular band. It was likewise necessary to remove a piece of growth on the right cord. After use of the scissors, the raw surfaces were thoroughly scraped, and chloride of zinc, 30 grs. to the ounce, applied.

Dr. Galloway's examination of the removed portions corroborated the opinion expressed in his previous report (on the fragment removed for diagnostic purposes), that the neoplasm was a squamous-celled carcinoma. With regard to the portion of ventricular band, the report was that 'the mucous membrane on its surface is much altered in structure by chronic inflammatory change, so that in parts little of the epithelium is

FIG. CCCXXXV. APPEARANCE DELINEATED BY DR. FELLOWS.

FIG. CCCXXXVI. APPEARANCE AS NOTED BY DR. RAMON DE LA SOTA.

FIG. CCCXXXVII. APPEARANCE AS SEEN BY AUTHOR.

left. Chronic induration, with the formation of fibrous tissue, has resulted, and processes of this inflammatory tissue are observed passing down between the underlying mucous glands. Neither in the mucous membrane, nor in the mucous glands lying below, is overgrowth of epithelium noted. This portion of tissue is therefore free from the carcinomatous changes, so distinctly seen in that taken from the vocal cord; and it appears that the patient has suffered from carcinoma, commencing in the region of the vocal cord, but that it does not seem to have become widely spread.'

The patient made an excellent recovery, and, travelling abroad, was seen in February 1896 by my esteemed friend Dr. Ramon de la Sota, who found 'a small growth, having a granular surface, located at the anterior end of the vocal cords, and below them.'

The patient came under my notice again on March 26, 1896, when I was able to verify this statement, though this second neoplasm could only be seen when the cords were open, and partook, in my judgment, of the nature of granulation in the line of union. When closed, nothing untoward was apparent, except a slight irregularity of the left ventricular band.

The patient was treated for several weeks with almost daily passing below the cords of a probang, on the principle of Voltolini's, only that the cotton-wool end was charged with a solution of chloride of zinc.

In two months nothing whatever was to be seen, and Dr. Fellows, writing from Chicago on the 25th day of June, wrote:—'I am delighted with the condition; the

reformation of the vocal cords and the restoration of the voice are both quite remarkable.'

May 21, 1898.—The patient presented himself to me. His larynx was absolutely normal in appearance, and with no trace on the vocal cords of any operation. He spoke in a quite clear though small voice, and was found to have gained 14 lb. in weight on that registered.

My colleague Dr. Jakins, who had assisted me at the operation, examined the patient at this latter date, and was able to confirm the restoration and health of the vocal cords.

CASE CLXVII.—*Laryngo-fissure and removal of a growth deemed to be malignant by previous microscopical examination of a fragment, with an after-history tending to demonstration of it as benign. Recovery, with complete restoration of voice, and in good health twenty-two months later.*—Miss H., a single lady, æt. 30, had been under my care in January 1891, when I had removed by means of the snare a small papillomatous growth from the right vocal cord (Fig. CCCXXXVIII). This was judged at the time

FIG. CCCXXXVIII. FIG. CCCXXXIX.

FIGS. CCCXXXVIII. AND CCCXXXIX.—APPEARANCES PRESENTED AT THE RESPECTIVE DATES.

to be benign, but was not histologically examined. At this second visit (1st October 1896) I was informed that the voice remained quite clear until six weeks previously, since which date it had become gradually more and more hoarse. With the *laryngoscope* recurrence was observed in the same situation as on the former occasion of an apparently similar neoplasm, except that it was of smoother surface (Fig. CCCXXXIX.). Laryngo-fissure was now performed, solely on the result of microscopical examination of a removed fragment; and the period that elapsed between the minor and the major operations was only six days.

The microscopical reports are appended. They offer an additional point of interest, in that whereas it is in the experience of all that a superficial fragment of a really malignant growth frequently appears to be benign, it is rare for the surface tissue to exhibit features pointing to malignancy which are not to be observed in the deeper structures. Moreover, the increased activity noticed at the surface in the examination of the mass appeared to enforce the wisdom of Newman's injunction, that before removing a fragment for a preliminary examination, the patient should be prepared for the speedy adoption of the more radical procedure, should it be indicated. The subsequent history of the case would appear to indicate that the growth had undergone no malignant transformation. Nevertheless, it is clear that the prompt performance of laryngo-fissure has had

none but a beneficial effect; for in July 1898 the patient was in perfect health, and spoke with an absolutely clear voice.

Microscopical reports, by Mr. Wyatt Wingrave:—

No. 1. October 2, 1896.—'The portion of tissue which you sent me this morning is composed for the most part of densely-packed stratified epithelium, arranged in concentric masses ("nests"), and, judging from this feature, I fear the process is malignant in nature' (Figs. CCCXL. and CCCXLI.).

No. 2. October 8, 1896.—'The four portions weighed 11 grs. (the largest one being 7 grs.). The smaller fragments consisted of mucous membrane and blood-clot.

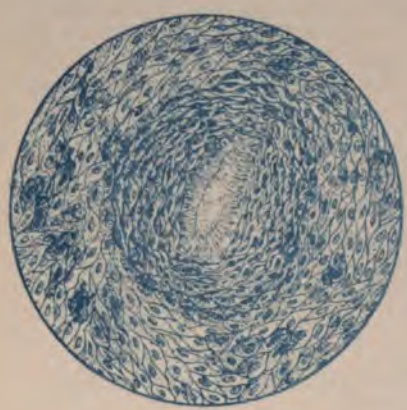


FIG. CCCXL.—($\frac{1}{6}$ *in. Obj.*)

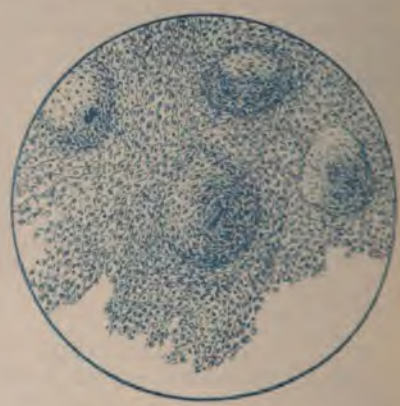


FIG. CCCXLI.—($\frac{1}{6}$ *in. Obj.*)

FIGS. CCCXL. AND CCCXLI.—ILLUSTRATING MICROSCOPIC APPEARANCE IN CASE CLXVII., OF FRAGMENTS REMOVED, *October* 2, 1896.

The larger fragments consisted of a mass of branched and spindle-shaped connective-tissue cells, interspersed with densely-packed elastic fibres, evidently the substance of the vocal cord. The surface was covered with stratified epithelium, considerably thickened and arranged in the form of nests, some of which were solid, and some contained a vascular core. In places there was much indentation of the epithelial covering, causing, with the irregularities of the thickening, a fimbriated appearance.

'In other places the cells formed blunt promontories, connected with the main mass with constricted pedicles (Figs. CCCXLII., CCCXLIII., CCCXLIV., and CCCXLV.).

'The cells composing these papillary nodules were for the most part normal, as regards their size and their nuclei; but where the indentations occurred, the cells were irregular in size, shape, and contents, being vacuolated, multinucleated, and irregular in their arrangement. In the substance of the sub-epithelial tissue, here and there stray masses of epithelium formed isolated groups.

'There were no well-defined epithelioma nests. Small cell inflammatory tissue was present in well-marked quantity, but no indication of giant cells. Skeletal muscle fibres and mucous glands appeared very scanty, while small blood extravasations were numerous. The foregoing characters indicate a neoplastic process of slow growth, which shows indications of a recent activity and irritability. The want of stability which the epithelium shows in certain parts is strongly suggestive of a transition from what is evidently a simple papillary growth to one of a more active nature. The limits of the epithelial growth have evidently been reached in the operation, and removal is complete.'

Although my first case of laryngectomy (No. CLXIV.), in-

volving removal of half the thyroid, half the cricoid, and one of the arytenoid cartilages, was immediately successful, I came to the conclusion that it was an operation not desirable in patients over sixty years of age, and that, after that period of life, I should

FIG. CCCXLII.—($\frac{1}{6}$ *in. Obj.*)

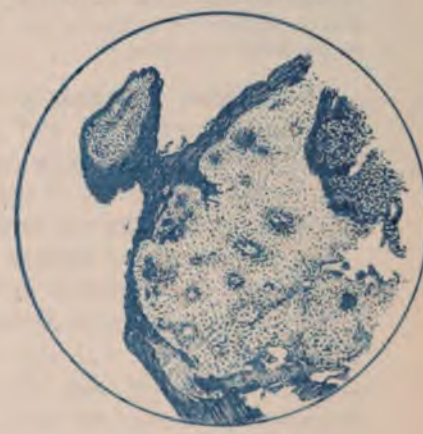


FIG. CCCXLIII.—(2 *in. Obj.*)

FIG. CCCXLIV.—($\frac{1}{4}$ *in. Obj.*)

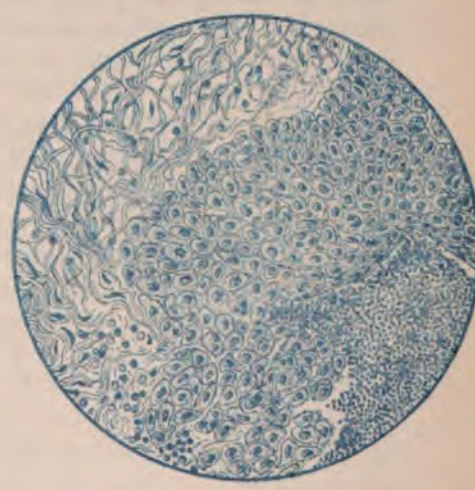


FIG. CCCXLV.—($\frac{1}{6}$ *in. Obj.*)

FIGS. CCCXLII., CCCXLIII., CCCXLIV., AND CCCXLV.—ILLUSTRATING MICROSCOPIC APPEARANCES OF PARTS REMOVED BY OPERATION, *October* 8, 1896.

in future advise a tracheotomy as the limit of operative procedure. The following case is an example:—

CASE CLXVIII.—A gentleman, æt. 63, developed epithelioma of the left vocal cord early in 1894, subsequent to an attack of influenza. Laryngo-fissure was urged, but, in

accordance with my advice and that of others, was not adopted. As a consequence, to quote the patient's own words, twelve months of comfortable life, and, I might add, of usefulness and distinction, were afforded. Unfortunately, my further advice that tracheotomy should be performed as soon as inspiratory attacks of stridor were observed, was not followed, and the warning that it might be hurriedly resorted to was verified. At this date, however, the disease had advanced too far for the tracheotomy to do more than obviate death by suffocation, and the end came a few weeks later with invasion of the œsophagus and perforation.

Sublingual pharyngotomy, which consists in division of the thyro-hyoid membrane, and removal of the growth through the opening thus made, is only applicable to disease of the epiglottis, and is also a procedure of very limited and doubtful value. The statistics of mortality are very unfavourable.

3. **Hygienic** and **dietetic** treatment in the case of laryngeal cancer may be comprised in very few words. Protection against impurities of the inspired atmosphere by respirators, and residence in pure air, with the avoidance of tobacco and of ardent spirits, as well as of any habit or occupation likely to induce local irritation, are to be enjoined. So soon as there are symptoms of dysphagia, instead of efforts being made to force the deglutition of solids, an immediate change of diet should be advised, and fluids and semi-solids, or at least artificially masticated and peptonised foods, should be prescribed. In some instances, an occasional rest for a few days of the function of deglutition, and limit of the act of swallowing to only sedative and thirst-allaying drinks, with administration of nutriment *per rectum*, is attended by improvement when attempts to swallow are resumed. Feeding by an œsophageal tube, except temporarily after operations, is a somewhat hazardous process, as perforation of the œsophagus may thereby be unintentionally induced. Swallowing of the raw egg *en bloc* is almost always possible, and the recommendation to suck small pieces of ice is a measure that is always gratefully acknowledged by the patient. Applications of cocaine prior to food-taking give relief in some cases, but this is a matter rather medical than hygienic in character.

CHAPTER XXVIII

NERVOUS DISEASES OF THE LARYNX

REVISED AND EXPANDED BY THE LATE JAMES CAGNEY, M.D.

(*Open out* PLATE XIV. *at end of the Book, during perusal of this Chapter*)

[In the belief that neuroses of the larynx had been treated, in all manuals on diseases of the throat, too exclusively from the limited aspect of the laryngeal mirror, I had asked the late Dr. Cagney, as a distinguished neurologist with whom the laryngoscope was not unfamiliar, to revise this chapter. This he was happily enabled to accomplish to the extent of an almost complete rewriting, before his regrettably early death; but prior to the opportunity for mutual discussion of his contribution. Greatly as I regret that this opportunity was lost, I conceive it my plain duty to let the article stand as it was written, with the simple addition of a few illustrations of the laryngoscopic features characteristic of the various nervo-muscular lesions.—L. B.]

THE writers who have applied themselves to a systematic treatise upon the subject of the nervous affections of the larynx, have in every case felt and acknowledged at the outset the difficulty they experienced in their choice of a suitable classification. Various classifications have been adopted with varying degrees of success. To us it seems best to aim at a plan which will enable us to place most prominently before our readers those clinical facts which are of chief importance, while we preserve as far as we can a method which has become familiar by its use in works upon nervous diseases and in medical works generally. A good classification, it seems, should also be one founded, as far as possible, upon general principles, leaving room to record the result of discoveries yet to be made, without violent distortions of its headings. Adopting the general, and, as we think, the most expedient course, we shall make a first broad division of these diseases into (1) the sensory, and (2) the motor. The second obviously presenting itself under two aspects, (*a*) that of spasms or over activity, and (*b*) paralysis or diminished activity. Dealing with the latter,—laryngeal paralysis,—we shall describe them in order as they are due to lesions of: first, the nerve trunk;

secondly, the bulbar centres; thirdly, the cortical centres and other intracranial structures; fourthly, affections primarily of the muscles of the larynx; fifthly, functional (hysterical) paralysis, as a thing of which our knowledge is purely clinical, and which cannot be assigned a place in any pathological system, will be noticed by itself.

Disorders of Sensation.

Anæsthesia is a condition of the widest significance. It varies extremely both in degree and distribution. It may be limited by the glottis either above or below, and it may be restricted to one or other side. When bilateral, it is often more marked on one side than the other. Sensation may be tested in the ordinary way by a probe, with the help of the laryngoscopic mirror, or carefully localised electric currents may be used (v. Ziemssen). With anæsthesia to pain and touch the sense of temperature may be retained or abolished. A condition known as *anæsthesia dolorosa* has been described by Schnitzler. The commonest cause is hysteria. In this affection unilateral anæsthesia is rare, and especially so, according to Lichtwitz, in cases of cutaneous hemianæsthesia. In such cases the larynx usually escapes, or, if implicated, it suffers in its whole extent. Bilateral anæsthesia is found in epileptics during the attacks and for a short time afterwards, in general paralysis (Lennox Browne), also in asphyxia and in chloroform narcosis. The sensitiveness of the larynx is usually lessened in syphilitic laryngitis, and notably so in lupus and leprosy. Hemianæsthesia has been recorded in cases of cerebral disease (Ott, Lõri) in connection with tumours at the base of the skull (M'Bride, Fränkel, Schech), as a result of injury to the recurrent laryngeal nerve (v. Ziemssen), and in lead poisoning. Of peripheral causes the most important is diphtheria. Anæsthesia due to diphtheria is entirely supra-glottic. That due to lesion of the recurrent laryngeal, on the other hand, is infra-glottic. The fauces and soft palate, moreover, participate to some extent in diphtherial anæsthesia, while motor troubles are seldom or never absent.

The Symptoms call for no further notice, but it has been made a diagnostic point that in anæsthesia the epiglottis is seen with the laryngoscope to stand upright. [Such an appearance is, however, probably accidental.—L.B.]

The Diagnosis is to be established by direct exploration. Accuracy is especially needed in connection with diphtheria, since

the neglect to reckon with the anæsthetic larynx may lead to fatal accidents, through the inspiration of particles of food.

The PROGNOSIS in a case of laryngeal anæsthesia varies with the cause. In that due to hysteria it is generally good. The same may be said in cases of diphtheria. Here the condition is much benefited by treatment, but it tends to get well of itself in from five to eight weeks. Anæsthesia from other peripheral causes also offers a good prospect of cure. When due to central or bulbar lesions, it is otherwise.

TREATMENT may, in the first case, consist in feeding by the stomach tube so soon as the vestibular surface is known to be insensitive.

The other resources of relief in cases where the anæsthesia is due to peripheral causes, are mainly the use of an electrical current, generally the faradic current, or combined galvanism and faradisation, and the administration of certain drugs. In electrification of the anæsthetic larynx Ziemssen recommends that the intra-laryngeal electrode be applied to the anterior part of the sinus pyriformis, a point at which the superior laryngeal nerve is most accessible. Strychnine is a valuable remedy. Iron also is frequently called for, and phosphorus or phosphide of zinc, in doses of one-third of a grain, is very useful in hysterical or neurasthenic subjects. Anæsthesia due to gross lesions of the brain or medulla does not respond to treatment.

HYPERÆSTHESIA.

The sensitiveness of the larynx under manipulation varies greatly in different subjects. The term hyperæsthesia may profitably be restricted to those cases in which the condition is evinced independently of interference from outside. Again, hyperæsthesia must be distinguished from neuralgia.

It occurs most commonly in hysteria and neurasthenia, in anæmia and prolonged dyspepsia (Ariza) and in alcoholic subjects. It appears temporarily, according to Gottstein, during teething, menstruation, and pregnancy. Hyperæsthesia, too, is a constant symptom of acute laryngitis and some chronic catarrhal processes, of carcinoma frequently, and in particular of laryngeal phthisis. It may precede all other evidence of phthisis, and this fact should be borne in mind in estimating its significance in certain cases.

The chief evidence of hyperæsthesia is an increase of reflex

excitability. It may be associated with paræsthesia and neuralgia.

The PROGNOSIS varies with the cause. It is favourable in hysteria, and when it arises in the course of pregnancy. It is very grave where there is reason to suspect its connection with tuberculosis.

TREATMENT may be local or general. Neurasthenics should be submitted to a course of hydropathic treatment and other appropriate remedies. The administration of bromides may be called for. Hot compresses externally, and the application of cocaine locally, give temporary relief. Cauterisation of sensitive spots, both near and distant, may also lead to benefit.

Neuralgia consists of definite pain, sometimes attended by tender spots (Fränkel). The pain may be continuous or paroxysmal; and it may be spontaneous or caused by some movement. The effort to speak is an exciting cause, especially amongst hysterical women. This has been called *phonophobia* (Thaon, Gottstein). In general, women are more often the subjects of laryngeal neuralgia than are men. The pain is commonly localised at the great cornu of the hyoid bone, and radiates outwards to the ear, or downwards along the larynx and trachea (Ruault). Laryngeal pain is sometimes dependent upon disease in the naso-pharynx, or it may be in the lingual tonsil, and an examination for such should always be made. It may depend upon anæmia, rheumatism, or gout, and the possibility will be borne in mind with a view to treatment. Antipyrin, exalgin, and quinine and opium, are often beneficial. The application of extremely hot compresses gives relief; and if a tender point can be made out, pressure over this is said to be effective (Morell Mackenzie). The use of a galvanic current by means of an intra-laryngeal electrode should not be omitted. The positive pole must be applied locally, the negative being placed at a distance upon the chest or back. If this distinction be neglected, and the negative pole employed *in situ*, the pain, instead of being relieved, will be greatly intensified.

Paræsthesia.—Sensations of heat, of pricking, or of tickling, or as of the presence of a foreign body in the larynx, are sometimes met with in persons who are subject to hysteria, neurasthenia, or hypochondria. Such sensations, however, are by no means to be taken as evidence of these states. They are very often to be accounted for by changes in the venous circulation as has been explained in connection with a similar condition of the pharynx (Chapter XVI.). The so-called paræsthesia which so

commonly precedes the recognition of phthisis must be held to be due to tissue changes not yet perceptible. A complaint of the sensations referred to should always lead to a careful examination, not only of the larynx, but by means of the mirror of the whole visible extent of the air passages, since morbid states of these, and especially of the pharynx, palate, and faucial or lingual tonsils, will often be found to afford the explanation.

TREATMENT will be varied, and must always involve the removal of a suspected organic cause. The affection has generally a tendency to recur, especially where, the primary cause not having been discovered, remedies have been mainly palliative.

Laryngeal vertigo.—The term laryngeal vertigo was given by the late Professor Charcot to a remarkable disease which he first described in 1876. It has been known by other names also, as laryngeal apoplexy, laryngeal syncope (Armstrong), and complete glottic spasm in adults (M'Bride). The whole number of cases of the disease hitherto recorded is less than fifty. It will find its place most appropriately between the sensory and motor laryngeal disorders, since clinically it cannot be held to belong in a strict sense exclusively to either, and from a pathological point of view nothing definite is known about it. The earliest and a very complete account of the attack in laryngeal vertigo is furnished by Charcot as a *resumé* of five cases—his own and another recorded by Gasquet—shortly after he had first called attention to the symptoms, and three others subsequently recorded. The typical attack is as follows:—A momentary sensation of tickling or similar discomfort, referred to the larynx, is followed by a fit of coughing of greater or less severity, obscurity of vision, giddiness, and then the patient falls unconscious; the face is congested, and there may be epileptiform convulsions. Presently he returns to himself, and usually retains no trace of the disturbance he has undergone. Subsequent experience has modified this description in certain particulars, but it must at once be said that many cases recorded as laryngeal vertigo are not instances of that comparatively rare disorder, since they can without violence be referred to other and commoner conditions. Some of these cases are examples of epilepsy with a laryngeal aura. Others are instances of glottic spasm inducing unconsciousness, in neurasthenics or persons who are the subject of tabes. These must of course be excluded, as must also certain other cases of sudden death without glottic spasm occurring with some organic disease of the larynx. Instances of such sudden death are

vertigo, in which the cough is far from violent or prolonged, we see in M'Bride's explanation a reason rather for withdrawing from the category of laryngeal vertigo these cases of asphyxia from cough, than for following him so far as to apply his explanation to every case. Whether or not we accept Charcot's theory of a reflex and the analogy with aural and gastric vertigo, seems necessarily to imply a causation which is neither epilepsy, nor tabes, nor cerebral congestion. Restricting ourselves to this view of it as a clinical entity, it would appear that such uncertainty as exists has arisen from its confusion with other states resembling it, and the difficulty is chiefly in determining to what cases the name belongs.

Our first task, then, is to consider more closely the prominent **Symptoms.** The irritation or tickling in the larynx as the first event in the series is very constant. The cough is usually violent, and may be attended with spasm of the glottis. In this case the face becomes congested or purple, and asphyxia seems imminent. In other instances, however, the cough is very slight, and then instead of congestion there is pallor of the face. All at once, while the cough lasts, the patient falls either completely unconscious or only stunned. This condition lasts a few seconds, when he quickly recovers, without any feeling of languor or exhaustion, but occasionally somewhat confused. Where there are premonitory sensations, the urine is passed involuntarily and the tongue bitten, as in the cases related by Sommerbrodt and Newcomb; and where convulsions take place, as in some of Charcot's cases, these events in our view involve an element of doubt as to the nature of the attack. The occurrence of actual vertigo before unconsciousness is the rule, but not invariable. Again, unconsciousness is sometimes wanting, and the crisis is represented by vertigo alone (Ruault). The subjects of laryngeal vertigo are nearly always males in or past middle life. Obesity and the plethoric habit, gout and rheumatism, are commonly associated with it. The abuse of alcohol and excessive indulgence in tobacco (Lennox Browne, Krishaber, Ruault) have been noted either as predisposing or exciting causes. Syphilis is mentioned once. A neurotic disposition is probably of importance, and in a considerable number of cases the attacks have developed under the influence of depressing emotions. It is interesting to note as bearing upon the obscure pathology of this disease, that instances have been met with of a tendency to vertigo in general. One of Massei's patients had suffered in this way for ten years; laryngeal vertigo occurred for the first

time in the course of an acute laryngitis. A patient of Knight's had had several attacks of gastric vertigo. Chronic disease of the air passages, as bronchitis, emphysema, and asthma, or recurring attacks of acute bronchitis, are sometimes coincident, but the larynx is always free from disease, or at most but slightly affected (Ruault). Gasquet and Phillips have regarded the attacks as due to a chronic laryngitis, but this is not the general view. They come on usually without any provocation that can be discovered, although, as is natural, causes are commonly assigned by the patient. Amongst these are smoking tobacco, and especially cigarettes, with inhaling, snuff taking, eating, a sudden noise or a violent emotion, such as fear. It is doubtful whether any significance is to be attached to these incidents. As to the frequency of the attacks, the widest differences prevail. In a case of Charcot's there were as many as fifteen in the day; in others there have been but one or two altogether.

Much controversy has taken place as to the cause and nature of laryngeal vertigo. We have already had occasion to point out that there are other affections with which it has been confounded. One of these is laryngeal epilepsy. Epilepsy with laryngeal aura, and the signs which are generally held to point to an epileptic seizure, may with great probability be taken as evidence of that disorder, rather than as proof that instances from which they are absent are epileptic phenomena. In another group of cases, distinguished by severe organic disease of the larynx, and by the occurrence of death as a result of the attack,—cases to which the name of laryngeal apoplexy may be given,—a clinical difference is sufficiently clearly marked. The attempt to attribute the seizures to syncope from cerebral congestion, such as occurs in whooping-cough both in infants and adults, is tantamount to denying that cases occur from which cerebral congestion is presumably absent. We have seen, however, that the seizure takes place occasionally without cyanosis,—a symptom not inconsistent with cerebral anæmia,—the patient's face being blanched, and without the antecedent of a violent cough, which would, however, tend to negative the congestion hypothesis. Nevertheless in the majority of cases the cough is violent, there is cyanosis and a degree of cerebral congestion, and it is reasonable to regard the latter as an occasional factor in causation. We have indicated Charcot's hypothesis of a laryngeal reflex and central inhibition, and prefer to adopt this provisionally as the simplest and least exacting explanation.

The analogy with aural vertigo has this defect, that whereas the ear is known to be an organ interference with which will

cause vertigo, there is not the same reason to expect a similar result from impressions upon the larynx. Luc points out that the injection of cold water into the auditory meatus will often produce vertigo in apparently healthy persons, but no such effect is ever witnessed as a result of cauterisation or other energetic treatment of the larynx, and this author suggests that it is necessary to assume a special predisposition on the part of the subjects of this disease. It may be added, also, that the proximity of the semicircular canals afford an explanation for vertigo *ab aure læso*, and that the non-occurrence of vertigo in operative interference upon the larynx may be connected with the fact that laryngeal vertigo usually manifests itself independently of laryngeal disease. The reflex mechanism that produces the seizure is probably not a simple one. On the other hand, the analogy with aural and gastric vertigo is supported by facts already mentioned, which go to prove that certain persons have a tendency to vertigo in general, and that some of these have suffered from laryngeal vertigo. This circumstance strengthens the theory of reflex as against any other that has been brought forward.

Gray first suggested that, whereas in the laryngeal malady there is almost always unconsciousness in addition to vertigo, the former symptom is wanting in the auditory affection. It is to be added that in aural vertigo there is a more real disturbance of locomotor co-ordination than what is generally seen in the laryngeal analogue. In the second case, to be presently related, however, locomotion is distinctly and consciously disordered, and in a minor degree in the third. The same feature was observed in Krishaber's case. M'Bride rejects Gray's view, that the neurosis is rather of the nature of an epilepsy than a vertigo, because consciousness was not completely lost in every instance. It certainly was, however, in the majority. The same might be said with regard to muscular contractions. There is an admitted laryngeal spasm in every case, but in a few only, similar manifestations in the limbs. In M'Bride's patient there was exaggerated tendon reflex, ankle-clonus, spasmodic contractions of the palatal muscles, and occasionally spasmodic stricture of the gullet. In answer to this objection of M'Bride, the following remarks of Brown-Sequard on general epilepsy are very much to the point:—

'Of these two features—muscular spasm and loss of consciousness—neither is alone sufficient to establish the existence of epilepsy. Still, each of these two kinds of symptoms, when occurring in the form of an attack, is an *epileptiform* manifestation. . . . Two patients, who were brother and sister, were incompletely epileptic; one had only

attacks of convulsions, the other only attacks of loss of consciousness. Their father had been completely epileptic, and one of these two young patients had inherited one aspect of the disease, the other the other aspect.'

Again, Russell Reynolds states that he has seen attacks of *petit mal* with no other symptom than a loss of consciousness, and Brown-Sequard on this point says:—

'Therefore we must admit that sometimes a pure and simple loss of perception is all that exists in a seizure of *epilepsia mitior*.'

For our part, we do not see how the conclusion can be evaded, that the condition we are considering has more in common with the milder forms of epilepsy than with simple vertigo, and with the greatest deference for his opinion, it is difficult to understand how Charcot, in classing the affection as a vertigo, overlooked the convulsive symptoms in his third case, which has been already quoted. The movement of the arm in his patient, and the pain and rigidity in the shoulders and along the arm in one of our own, strikingly call to mind Brown-Sequard's remark that—

'In cases of epilepsy due to organic cerebral disease, or to cerebral congestion (much more rarely in other cases), there occurs rather frequently, either during the attack or before it, drawing of the head towards one shoulder.'

Before proceeding further, three cases will be related which have come under the observation of the author of this volume, and have appeared in former editions:—

CASE CLXIX.—Mr. T., æt. 61, a wine merchant, was seen by me in consultation with Dr. Keele of Islington, on November 30, 1886. He complained that for three years he had suffered every winter from irritation at the top of the throat, but he had got quite well in the summer.

So long ago as thirty years previously he had suffered from giddiness while smoking a cigar, the smoke seemed to have gone the wrong way; this made him cough, and he fell down immediately after in an absolutely unconscious state. Since then he had not smoked, and he now dreaded the atmosphere of tobacco, as it always predisposed to, if it did not induce, an exacerbation. On and off, at intervals of even years, he had had repetitions of these attacks of cough, followed by giddiness and unconsciousness; and once, four or five years before, a pinch of snuff had caused him to 'drop on the floor dead in a minute.' He was then reminded of the circumstance previously forgotten, that snuff had induced a milder attack of the same nature once before.

Two years previously, he had, on leaving a tramcar at the corner of his street, dropped insensible on the kerb. He had been hurried in crossing to the pavement, and remembered that he had a catch in his breath, with cough, before he fell.

The patient was an apparently healthy man, though rather florid in colour, and inclined to make himself an invalid, so much did he dread exposure to cold or any inclemency of weather. On looking into his throat, I saw that his uvula had been reduced, and, as he said, with advantage. Proceeding downwards, I then observed in the mirror slight congestion of his larynx; but above all, there was extreme varix of the base of the tongue, and of the lingual surface of the epiglottis. He said that he had been a fairly temperate

man, but that in the exercise of his vocation he had 'tasted' a great deal. He had discovered that his symptoms were always worse after such occasions. I recommended astringents, and later destruction of the varicose veins. I heard some twelve months afterwards from Dr. Keele that the patient derived undoubted benefit from my advice, but he did not summon courage to undergo an attempt at a more radical cure—that of galvano-cautery.

CASE CLXX.—Mr. William C., æt. 62, from Retford, consulted me on October 20, 1886, with the following history :—

He stated that six or seven years previously he had first been attacked with giddiness, which would cause him to fall insensible, and that this would occur seven or eight times in one day. He had not at first noticed that these attacks were always preceded by a cough, though he had long been aware of irritation in his throat, but as time went on the association was noted to be invariable. He described his sensations when unconscious as 'most delightful.' There was a tickling in the throat, a slight cough, and then a hardly more than momentary but complete loss of consciousness, which he found most calming to himself, though it was of course a very terrifying matter for his wife and children. He personally had not become frightened till he found he could not walk straight, and had to hold on to railings or to someone's arm to prevent his reeling. Once or twice his gait had led to the formation of unjust suspicions as to his sobriety.

About the year 1882 he had been under the care of another throat specialist, and, having undergone a long course of insufflations, with only a slight alleviation, derived immediate benefit on his uvula being cut. For a short time there was a complete cessation of his attacks, and though they soon returned, he had not since the operation had more than one a day. A new symptom had developed, namely, *intense headache* between the brows on the slightest cough, accompanied by a pain and rigidity in the shoulder, which extended down the right arm to the thumb.

The patient was rather markedly pale in complexion, but, as far as could be ascertained, free from organic disease.

On examining his nares, I found enlargement and hyperæmia of both inferior turbinated bones, with increased congestion of the left middle turbinated bone, and of the left nostril generally. At the base of the tongue there was a large congery of varicose veins, with some hæmorrhoidal prominences. This condition also was worse on the right side. There was some dyspepsia, but otherwise fair general health.

The following was the treatment :—Destruction of the veins by the galvano-cautery, searing of the nostrils also by the same process, administration of an alkaline and vegetable tonic, use of vaseline, with cocaine and eucalyptus oil, to the nostrils, and employment for several hours a day of an oro-nasal inhaler, containing ozonic ether and pine oil (Form. 39). He made great improvement, and after three months reported that he had not had one fit ; but though the headache had been less, it was not entirely relieved. I found all the veins had not been destroyed ; the cautery was therefore again repeated, with, so far as could be seen, further marked benefit to his symptoms.

CASE CLXXI.—Dr. ——, æt. 42, consulted me on account of giddiness—which he carefully distinguished from a mere dizziness—that occasionally arose when he sneezed, coughed, or blew his nose with the least increase of vigour. He stated that he always had a premonition of an attack, and had acquired the precautionary habit of holding on to a chair or other support when about to cough or sneeze. He had distinct confusion, and a feeling of cerebral tension ; but had only once—twenty years ago—been absolutely unconscious.

Lately, attacks of sneezing had been more frequent, and he had also suffered from nocturnal dyspnœa, which he considered to be of the nature of asthma. The patient had practised for twenty years in a poor neighbourhood of London. As a student in Dublin he had drunk rather hard, and on coming to town had taken freely of beer, though he had abjured spirits. Since a previous consultation with me two years ago, he had been almost an abstainer. The present local condition was one of hyperæmia of the turbinated bones

(turbinal varix), an exceedingly relaxed uvula, and varix at the base of the tongue. The treatment adopted was similar to that in the last case. The result was in every respect excellent.

PROGNOSIS of true laryngeal vertigo, so far as experience goes, is good.

TREATMENT must be considered from both the *local* and *general* points of view, of which the first may take precedence.

To be effectual, **local** measures must be directed to concomitant affections of the air passages.

In almost every case that has derived benefit, attention has rightly been directed to the pharynx rather than to the larynx.

There is frequently present in our experience a distinct and considerable degree of varix of the base of the tongue and upper part of the larynx, with a corresponding hyperæmia of the nares. It has been for so many years urged that capillary venous engorgement is the cause of granular pharyngitis, that the association of this last condition with the cases reported by other observers can readily be explained; and it is even probable that some form or other of varix in the pharyngeal and naso-pharyngeal regions would be almost always, if not invariably, found when looked for, and that, in many cases considered as instances of purely laryngeal or purely nasal reflex, the association of the two will, in the future, be more frequently recognised. Indeed, in many cases of aural vertigo also, nasal or pharyngeal hyperæmia is more frequently a concomitant symptom than is recorded. That all or any of these conditions may and are often the result of a fault in the systemic circulation, must be admitted; nevertheless the special circumstances of their localisation require to be reckoned with in connection with treatment.

Full directions for local treatment on these lines will be found in the foregoing pages, under the headings of 'Pharyngitis' (p. 270), 'Relaxed Uvula' (p. 317), or 'Chronic Inflammation of Lingual Tonsil and Varix' (p. 406). The nature of the remedial procedures has also been indicated in the history of the treatment of the foregoing cases, and it is hardly necessary to repeat that especially beneficial results can often be obtained from destruction of enlarged veins and hyperæmic hypertrophies by means of the galvano-cautery.

As to **general** measures, though bromides have allayed and doubtless will continue to allay symptoms, preference is given to iron and digitalis, or iron and ergot, with saline purgatives, moderate diet, and the avoidance of alcohol and tobacco.

MOTOR DISORDERS.

Disorders of the laryngeal motor apparatus are naturally divided into two categories,—those characterised by spasm and by paralysis respectively. We shall consider these separately.

I. *SPASTIC AFFECTIONS.*

The respiratory and vocal organs are subject under morbid conditions to the two forms of spasm, clonic and tonic. The diseased states accompanied by clonic spasm are for the most part those in which the larynx suffers in common with other organs as the result of central disease. Tonic spasm, which is probably always the expression of a neurosis, is apt to arise independently, and sometimes entails grave danger to life. The larynx, as a muscular organ closing the upper opening of the trachea, has for one of its functions the protection of the air passage against the entry of injurious substances. In this it acts automatically, and glottic spasm can be induced at any time by the irritation of its mucous surface, especially of the infra-glottic area. In addition to this, however, it has two other important functions, closely related to each other, but physiologically distinct, and even antagonistic in some respects. The distinction between the functions of the larynx as an organ of voice and as an organ of respiration is fundamental, and must ever be borne in mind while we study its more complex morbid states. In this distinction will be found the key to much that would be inscrutable without it. The physiological distinction has its pathological counterpart, and we find that a glottic breath-spasm exists in persons who have the full use of their voice, while, on the other hand, spasm in phonation exists independently of all embarrassment of breathing.

RESPIRATORY SPASM—SPASM OF THE GLOTTIS.

This consists essentially of a disturbance of the automatic muscular movements of the larynx, lasting from a few seconds to at most a minute or two. It happens occasionally, in the absence of other causes, during intra-laryngeal manipulation for the purposes of treatment, and in this way the opportunity presents itself of studying the phenomenon apart from apprehensions of grave danger. It is primarily the act of

inspiration that is interfered with. The vocal cords are forcibly and suddenly *adducted*. Respiration stops, the face assumes an expression of agony, and after an interval of suspense there is a long-drawn noisy inspiration, repeated several times with diminishing difficulty as the glottis gradually opens, until finally the normal type of respiration is restored. This event, so easily excited in healthy persons, occurs more readily in those who have already a degree of laryngeal obstruction, in diseases such as asthma, whooping-cough, and hydrophobia, and in peculiar states of the nervous system of which perhaps these latter are instances. There are, however, certain definite clinical states in which spasm of the glottis is a special characteristic, or of exceptional importance. These call for separate notice.

1. **Spasm of the glottis in infants — essential glottic spasm: child-crowing.**—This belongs to a morbid state peculiar to infancy or very early life. Children of from four months to two years suffer most, and males more often than females.

Its cause has been much discussed, and though a great deal of practical information is to hand, the matter is still somewhat involved. In the first place, there can be no doubt that those most subject to attacks of glottic spasm, whether in infancy or adult life, and under whatever circumstances produced, are persons of a nervous disposition. There is a certain class of neuropaths known as the spasmodic, and spasm of the glottis is the accident which befalls them most commonly.

The association of glottic spasm in children with rickets is hardly less constant, and the obvious connection between the two has induced many observers to regard the latter as the commonest cause of laryngismus stridulus. Thus Elvässer referred the latter to compression of the brain from disease of the skull bones.

According to Hughlings Jackson, the attack is the immediate result of medullary supervenosis, and this has been referred to loss of elasticity of the ribs from rachitic changes. It is possible that rickets is a factor in both these ways and in many others, as by anæmia, malnutrition, and through sources of peripheral and local irritation from glandular hypertrophy. It seems reasonable, therefore, to regard rickets, together with a hereditary influence and bad hygiene, as an important factor of the predisposition, while we see also in the rachitic process many of the more immediate causes of the attack.

The predisposition being present, the attack may be determined by a great variety of circumstances—exposure to cold, whooping-cough, emotions of fear or anger, and intestinal

irritation from worms or undigested food. Pressure upon the laryngeal nerves, as by enlarged glands, is undoubtedly effective. The liability of children to attacks of laryngismus stridulus has been connected with the fact that in them laryngeal inflammation, however slight, has a tendency to extend to the sub-glottic space, where it produces a potentiality of irritation which may at any time set up spasm.

Great importance attaches to the presence of adenoid growths in the vault of the pharynx (Lennox Browne, 1890). These vegetations, by blocking the natural breathway of the nose, and causing the patient to always breathe with open mouth, are probably present in the majority of children subject not only to laryngismus, but also to tetany and convulsions, which are both but exaggerated examples of the same disease. They may reasonably be held to account not only for the liability to exacerbations in cold and damp weather, but also for any or all of the reflex symptoms in the track of the pneumogastric nerve.

Mantle (1890) on the experience of one case, an infant, aged 8 weeks, has expressed the opinion that a relaxed uvula is a frequent cause of laryngismus at that age, but, as I pointed out at the time, excluding diphtheria, the paresis of the soft palate, which accompanies elongation of the uvula, is always secondary to the presence of adenoid vegetations or enlarged tonsils, for in practice it will be found that, when these growths are removed, the muscular contractility of the soft palate of a young child is usually quickly restored.

The attack itself is sufficiently described in books on general medicine. It comes on either during sleep or while the child is awake. It is usually repeated several times in succession. When severe, the convulsion is not limited to the larynx, but the face is thrown into clonic spasms, the hands are tightly flexed, the legs extended and the feet turned inwards.

Death sometimes occurs during the period of apnœa.

Some writers have attempted to draw a distinction between simple glottic spasm in infants and the condition which they say is alone associated with rickets,—a form of infantile eclampsia to which they have given the name of phreno-glottic spasm. Such a distinction seems to be unnecessary and inexpedient. It is based chiefly upon the fact that in certain cases there may be observed a simultaneous spasm of the larynx and of all the muscles of respiration, and that these cases are attended with greater dangers than others. But it may be doubted if such a thing as a purely laryngeal spasm exists. The separate parts of the

respiratory mechanism are so closely associated and interdependent, that disturbance of one part necessarily affects another. The view has been maintained here that the underlying condition is generally a tendency to spasm and to laryngeal spasm as a starting point of the disturbance. The diffusion of the disturbance, which is thus necessarily attended with great danger, a danger intensified by the fact that it occurs in the organically weakest subjects, seems to us insufficient to warrant the establishment of a separate clinical category.

2. **Spasm of the glottis in adults.**—It has been said that any sufficient irritation of the mucous surface of the larynx may cause spasm of the glottis in healthy persons. Such spasm is a true reflex. The tendency to its occurrence is increased under certain circumstances. Of these circumstances some are such as increase the irritability of the laryngeal mucous surface, as ulcerative and catarrhal states; other conditions lead to extension of the surface of origin of the reflex beyond the limits of health, as when there is hypertrophy or a new growth, such as polypus or adenoids in the air passages above the larynx, or even when there is a disturbance of a more distant organ, as the stomach. Dilatation of the stomach, for instance, is sometimes the cause of glottic spasm. Again, as has been said above, there are persons who are naturally prone to this form of disturbance, and in such persons the slightest trouble, whether local or operating at a distance, may be effective in producing it. This tendency implies a neurotic disposition, and its victims are usually subject to other neuroses.

Allied to these cases, and yet to be distinguished from them, is *hysteria*. Spasm of the glottis is a common phenomenon at the outset of the grand attack; sometimes it occurs alone, and may threaten life so immediately as to necessitate the performance of tracheotomy. As a rule, however, it passes without disastrous consequences.

Spasm of the glottis has been observed during the period of tonic convulsion in an *epileptic seizure*, and Löri has seen it in *meningitis*.

No good is to be gained by the discussion as to whether the spasm in all these cases is reflex or not. In hysteria, for example, where it may occur either in association with some obvious peripheral disturbance, uterine, ovarian, or intestinal, or, on the other hand, independently of any assignable origin, it is as reasonable to suppose that the condition is one of exaltation of reflex process comparable to that known to be present in other neuropaths, as to assume the intervention of a central cause.

The latter, however, is the more probable in the case of epilepsy and irritation of the cortex by meningitis.

3. **Irritative lesions of the recurrent laryngeal nerves.**—In a separate category must be placed the cases due to presence of an aneurysm or cancer of the œsophagus; mediastinal tumours, enlarged glands, tubercular pleurisy at the pulmonary apices, may induce glottic spasm, before proceeding to paralysis of the laryngeal muscles. *Tabes*, in which the sclerotic changes have implicated the medulla or the spinal accessory nerve, in addition to paralysis and inco-ordination, gives rise to the so-called laryngeal crises which are clinically similar to the attacks under discussion, but are further characterised by an extreme variety in their manifestations and a diffusion of the paroxysm beyond the limits of the larynx.

DIAGNOSIS in connection with spasm of the glottis is concerned chiefly in discriminating its cause. The examination upon which it is based will be guided by what has been said above. A careful investigation of the larynx and naso-pharynx must first be made. Paresis or immobility of a vocal cord will lead the observer to search for a pressure lesion of the recurrent laryngeal nerve. In the absence of this and of local trouble, the possibility of tabes will suggest itself, and it is only after the greatest care has been exercised that the assumption of a function reflex will be made. The presence of any gastric, intestinal, or uterine irritation must be sought for, and a verdict of hysteria will be pronounced with the greatest hesitation in any but a typical instance of that malady.

TREATMENT must be as various as is the possible causation. In the majority of cases of reflex spasm the crisis takes place during the night, and the physician has seldom the opportunity to deal with it directly. When such an opportunity presents itself, the application of hot and cold douches and fomentations to the neck, and the administration of alcohol and ether—the latter especially in the case of hysterical spasm—are the ordinary expedients. Tracheotomy may have to be performed in the last resort. Laryngeal spasm, apart from obstruction and not depending upon a lesion of the central nervous system, is rarely fatal, and the milder measures usually suffice to arrest an attack.

Treatment directed to removal of the cause will include the cure of any morbid state of the air passages that may be present, and efforts to improve the tone of the nervous system. Reflex exaltation will be met by the administration of bromides, morphia and codeia, phosphorus, phosphide of zinc and valerian, the

injunction of healthy food, clothing, and exercise, and the observance of hygienic rules generally. Irritability may be allayed by local applications of cocaine combined with the therapeutic measures above indicated. Other courses, such as dilatation of the stomach, flatulence, disorder of the intestines, liver, uterus, or ovaries, when detected must be dealt with. Even in the less hopeful case of central or peripheral nervous disease, the employment of subsidiary measures will give relief where a radical cure cannot be hoped for.

Phonatory Spasms.

We have seen that spasm of the glottis is essentially a disturbance of the breathing process, and primarily of inspiration. We have seen also that the disturbance is rarely, if ever, purely glottic, but that it tends to involve other parts of the respiratory mechanism.

There are other forms of laryngeal spasm different from this. For the most part, they belong to ex-spiration, and they are of short duration; they are not attended with danger to life; they constitute a habit whether psychical or organic, and they result in the production of a sound.

There is one variety of laryngeal spasm to which all these characters belong except the first. It is a spasm of inspiration having the same mechanism, and indeed resulting in the same sound, as a sob or hiccough. This sound, however, is frequently modified, having become, no doubt, by dint of practice, softened and less tumultuous and more comparable to the noise of certain animals. It is interesting to recall the fact that some animals, of which the cat and pig are instances, phonate in inspiration. The victims of this habit of inspiratory noises are nearly always hysterical, and its acquisition is apt to be the effect of mimesis. Epidemics of baying and mewing recorded as breaking out among women in France and elsewhere during the Middle Ages, are doubtless instances of this. Similar noises are made by patients of another class, in which the cause is less evidently psychical and is rather a stereotyped act with which the strongest will struggles in vain. The spasm in this latter case has justly been regarded as an instance of the *tic convulsive* with which we are familiar in other connections. *Laryngeal tic* is an eminently intractable disorder. The affection amongst hysterical women is suspicious, as are all the manifestations of that neurosis, but affords the usual prospect of cure by appropriate treatment (see page 324).

The **ex-spiratory** spasms which are evidenced by noises include some which, otherwise than in this mode of production, correspond very closely to those just mentioned. The equivalent of the inspiratory tic is represented by a variety of forms as great as in the range of articulate speech. It is represented by sounds having no relation to language—humming, groaning, a cry, a sort of bark, spontaneously executed at intervals—are common examples. The habit of ejaculating certain meaningless words or phrases, of which the phenomenon known as *coprolalia* is an instance, must be included here, though there is obviously concerned in its production a highly complex central agency.

Nervous or hysterical cough is the expression of a neurosis which consists in a morbid sensitiveness to peripheral irritation, whether localised in the larynx or elsewhere, such sensitiveness resulting in a special reflex, namely, cough. The cough of this origin has generally a character of its own by which it can be recognised, and the great majority of those who suffer from it are known to be affected by the neuropathic taint. The neurosis in question may or may not in a particular case be part of the nosological whole which provisionally bears the name of hysteria. This conception of the disorder seems to be at once the most definite and the most comprehensive that our knowledge warrants. By some authors the term nervous laryngeal cough is restricted to those cases in which the reflex is supposed to originate in the larynx from hyperæsthesia, and independently of any lesion. This distinction, however, involves the fallacy of assuming that our knowledge and means of investigation are perfect and adequate to the detection of every local change. Again, an attempt has been made to distinguish between two forms of hysterical cough, one being supposed to be of central origin, the other dependent upon peripheral irritation—auricular, laryngeal, nasal, pharyngeal, uterine, ovarian, or some other. But, in the first place, there is no reason and no necessity to believe that a cough of purely central origin exists, apart, at least, from central irritation, as by a tumour. To predicate that any morbid organic act in the hysterical is purely central and independent of all reference to the periphery, is a most hazardous speculation. It would seem to arise from a misconstruction of the psychical phenomena attending that neurosis, phenomena which lend themselves rather to the common belief that the central change in hysteria is one of defect, a defect of inhibition. In virtue of this defect, the mind is at the mercy of suggestions derived from outside, and the organism is morbidly prone to respond to stimuli originating at the periphery. Such stimuli

may be imperceptible, but it is not safe on that account to deny their existence. A distinction of the kind sought can reasonably be based only upon clinical differences, and those are wanting. In hysteria, as under other circumstances, nervous cough must be regarded as a reflex dependent upon predisposition, but determined by peripheral irritation, however slight or inconspicuous.

This condition has been called *laryngeal chorea*, a name first given to it by Schroetter, but one which is entirely inappropriate. The laryngeal movements which have been seen laryngoscopically in hysterical persons, whether afflicted with nervous cough or not, may more properly be regarded as *hysterical tremors*. Chorea does undoubtedly affect the larynx at the same time as other parts, and will engage attention later; but chorea limited to the larynx must be very rare, whereas hysterical tremors and rhythmical chorea—a form of hysterical tremor—are very common. Such tremors are evidence of hysteria, but they are not the cause of cough.

Nervous cough may be modified by morbid conditions of the air passages. In its typical form it consists of a series of expulsive efforts of a peculiarly harsh sound, occurring, it may be, with each expiration or less often, and persisting without interruption during waking hours for a period sometimes of several days, weeks, or months. During this time the patient gets no rest. Nothing serves to alleviate the discomfort, which is evidenced by a face of worry and anxiety. The cough is at times more violent than at others, and may be attended with free perspiration, but there is never dyspnœa. It ends as it begins, more or less suddenly, and without reference commonly to any discoverable cause.

The subjects of nervous cough are usually either hysterical, or display signs that their nervous organisation is of the kind which is said to exhibit the neuropathic taint. This, however, does but constitute the disposition.

TREATMENT will concern itself with the effort to discover and to remedy some possible source of irritation. The nasal fossæ, naso-pharynx, pharynx, and the larynx itself must be attended to, with the greater care in that the assumption is not that the cough is truly a *tussis sine materiâ*, but apt to be provoked by infinitesimal irritation. In particular, care must be taken to remove the causes of venous congestion, as lingual and pharyngeal varix. Enlarged tonsils—faucial, pharyngeal, and lingual—will be recognised as a probable source of irritation. In every case the air passages should be put as far as possible in a condition of health. Sources of less direct peripheral irritation will then be sought. These may be uterine or ovarian, and if so, may be connected

with the states of pregnancy or menstruation. When the retention of effete products within the bowel has been permitted, this may reasonably be an object of suspicion. It is unnecessary to detail all the indications for treatment of this kind, and they are practically without limit. Deep pressure over the ovaries or manipulation of hysterogenic zones are sometimes temporarily effectual. The neurosis itself is peculiarly intractable, and from this it results that remedies applied to cure it have, generally speaking, but little efficacy. Another expression of the same fact is that the cough has a tendency to recur. Opiates and narcotics, bromides and depressant remedies, anæsthetics and antispasmodics, do little good. The general condition of the patient must be attended to. A course of baths, judicious food and wholesome discipline, change of air and the removal from emotional influences, will work for good. Of medicinal remedies, Ruault, on the authority of Charles Bouchard, gives the highest and indeed exclusive praise to strychnine administered in large doses.

II. *LARYNGEAL PARALYSES.*

Clinically, paralyses of the laryngeal muscles express themselves as paralyses of the vocal cords, and as such they must be studied by means of the laryngoscope. The anatomical and physiological peculiarities of these muscles, their small size and remote situation, their inaccessibility to direct observation, the manner in which their fibres are blended or contiguous, and the perfection of co-ordination which they exhibit, are difficulties in the way of a precise understanding of affections implicating them. Nevertheless much light has been thrown upon the nature of these affections by the study of their pathology and development, combined with experiments upon animals, and it is possible to treat of them in the systematic method based upon anatomical distinctions which is that generally adopted in the case of diseases of the nervous system.

We shall consider separately—(1) Paralysis from injury or disease of nerve trunks; (2) paralysis from bulbar lesions; (3) paralysis from disease of the brain; (4) paralysis from affections of the muscle fibres themselves; (5) hysterical paralysis.

Paralysis from Injury or Disease of Nerve Trunks.

The symptoms of injury or disease will vary, first, with the position in which the injury takes effect; and secondly,

with its nature and degree. We must accordingly distinguish such lesions, when localised, as lesions of the laryngeal, vagus, and spinal accessory nerves respectively, and also pay some attention to diseased states in which the injury is diffused, and its effects therefore less precisely defined.

A. **Superior laryngeal nerve.**—Injuries of the superior laryngeal nerve are rare. They have been recorded as a result of attempted suicide and in the course of surgical operation. Disease of the nerve is a sequela of diphtheria, typhoid fever, and probably of other conditions which cause neuritis.

The *symptoms* are anæsthesia of the interior of the larynx, with hoarseness, inability to produce high notes, and fatigue on using the voice. These latter symptoms are referred to loss of function of the crico-thyroid muscle which is supplied by a branch of the nerve. In a case of Newman's the laryngoscopic appearances were those of relaxation of the vocal cord, which also was said to be on a higher plane than that of the other side.

B. **Recurrent laryngeal nerve** (Figs. 123, 124, 126, PLATE XIV).—Injury to the recurrent laryngeal nerve is generally from direct injury or pressure by morbid growths in some part of its course, and from the differing anatomical relations of the nerve on either side, the two vary in their liability to injury. The lesion may of course be bilateral. Statistics show what would have been expected, that the left nerve suffers more often than the right.

The *symptoms* derived from a lesion of the recurrent laryngeal nerve vary not only as the lesion is one-sided or bilateral, but in a remarkable manner according to the degree and the rapidity of progress in which the nerve becomes affected. The distinction depending upon the latter circumstance is not merely that with which we are familiar in analogous affections of peripheral nerves elsewhere, but also that between irritative effects and loss of function. It is a destruction which, so far as our knowledge goes, is quite peculiar to the case of laryngeal motor innervation.

Already, in 1860, Traube had diagnosed two cases of aortic aneurysm from the laryngoscopic appearances indicating paralysis of the left vocal cord. The abundant literature of which this communication was the prelude contains the records of very many cases of paralysis from pressure on the recurrent laryngeal nerve. The assumption was easy and obvious, that paralysis from such a cause would affect indifferently, and, on the whole, with the same frequency, each of the muscles supplied by fibres from the nerve that was compressed. Gerhardt, writing in 1863, declared that, in paralysis of the vagus and recurrent laryngeal

nerves, certain fibres of the injured nerve might be affected separately or in a preponderant degree. Further experience and research were destined to expand this statement, and to give to it a very unexpected significance. A new and important development began with the study of a group of symptoms,—noisy inspiration and inspiratory dyspnœa, with unimpaired voice and unimpeded expiration,—a condition which was spoken of as '*bilateral paralysis of the abductors of the vocal cords*,' and with the appearance, in 1876, of Riegel's classical work upon *Respiratory Paralysis*. This treatise is a masterly analysis of the facts already accumulated by Gerhardt, Türck, Morell Mackenzie, and Hughlings Jackson; but as yet there was no hint of the remarkable fact that a lesion, apparently implicating the whole trunk of the recurrent laryngeal nerve, could under any circumstances affect only the corresponding abductor. Ottomar Rosenbach of Breslau published, in 1880, the notes of a case in which pressure by a cancer of the œsophagus on both recurrent laryngeal nerves had caused bilateral paralysis, first of the abductors, and subsequently of all the muscles supplied by the injured nerves; and he expressly pointed out that, in such cases—namely, of paralysis from pressure on the recurrent laryngeal nerve—the function of the abductors may alone suffer in the first instance. It has been contended that this statement was not justified by the evidence at Rosenbach's disposal. With this question and the subsequent controversy we are not concerned. Rosenbach's proposition was undoubtedly correct, but it was only a partial statement of the truth. The remainder was established by the researches of Semon (1881). In a number of cases which he examined, he found that, with a lesion of the nerve, whether central or peripheral, and of an extent and severity, as it seemed, sufficient to affect in an equal degree the function of all its component parts, the abductors were paralysed either alone, or previously to and in a greater degree than the adductors. He then instituted a diligent search into the records of cases reported by other observers, and found that in none were the adductors affected in like manner preferably to the abductors. The number of cases examined was believed to be sufficient to have produced an exception to this remarkable fact if any had existed.[1] Von Ziemssen, in 1876, repeating Gerhardt's statement that in central or peripheral lesions of the laryngeal motor nerves certain fibres might happen to be alone or preponderantly implicated, still declared that it was a *matter of accident* as to

[1] Schroeter has reported one.—L. B.

which nerves or muscles should so suffer. Rosenbach had made the statement, that in cases of pressure on the recurrent laryngeal nerve it was the abductors which during life displayed the earliest and most decided symptoms of paralysis. It was now incontestably proved that the preferential incidence of the proclivity to paralysis followed an invariable rule, that it singled out the abductors in all cases, and that it mattered not in what part of the neuro-muscular tract the lesion was placed—whether in the medullary centre, the vagus, or the recurrent laryngeal nerve. A fact so remarkable, and in a sense at variance not only with expectation but with all conceptions founded upon analogy, demanded an explanation, and several were speedily forthcoming. Morell Mackenzie conjectured that perhaps *the abductor filaments were more superficially situated* than the adductor, or that the latter were possibly reinforced by the superior laryngeal nerve. Bosworth suggested that abductor paralysis was *always of central origin.* The first of these hypotheses fails as an explanation where the lesion is central, and the second involves an assumption which is disproved. Gowers ascribes the relative immunity of the lateral crico-arytenoid to a *supposed mechanical advantage* in its action. The theory of Cohen-Tervaert relies upon Exner's views as to the part taken by the superior laryngeal in the innervation of the larynx, and is well answered by Semon, as are others propounded by S. Solis-Cohen, Jelenffy, Tissier, and Wagner.

The explanation which has attracted most notice, and which is still sustained by its author, is that of Krause of Berlin. It is known as the *contracture hypothesis.* Krause inferred, from certain experiments upon animals and from other considerations, that the condition in question was a phenomenon of excitation, that it was not a primary paralysis of the posterior crico-arytenoids followed by contracture of the antagonists, but that it was a primary paralytic contracture of all the muscles supplied by the recurrent nerve, in which the *contracture of the abductors preponderated.* Semon opposed this view. While it is admitted that even in man very acute lesions of the recurrent laryngeal nerve may have an irritative influence, it is contended that the ordinarily progressive organic affection cannot bear this interpretation; that the pressure exercised upon a nerve in other parts of the body by a slowly growing tumour causes not contracture, but paralysis; that in cases of multiple central (bulbar) lesions the resulting phenomena are, with this exception, if it is an exception, paralytic; and, finally, that contracture cannot

account for the marked and invariable degeneration of the posterior crico-arytenoid muscle and of the nerves supplying it in the cases now under discussion. This degeneration, indeed, is one of the most remarkable facts in connection with abductor paralysis, and presents an insuperable objection to most of the hypotheses now under discussion. It is abundantly proved that central and peripheral lesions which cause a preferential paralysis of the abductors produce also degeneration of the fibres of the posterior crico-arytenoid, and that this muscle and its nerve are not merely more subject to paralysis from organic injuries than are the adductors, but that they have a decidedly smaller power of resistance. Functional paralysis, on the other hand, or that for which no organic cause can be assigned, and which is not attended with consequent degeneration, is known only to fall upon the adductors.

The diminished resistance of the abductors rests upon evidence of the most various character. Thus Jeansêlme and Lermoyez showed that, in persons dead of cholera, the posterior crico-arytenoid are the first of the muscles supplied by the recurrent nerve to lose their contractility. The same fact has been demonstrated in various animals; and Risien Russell, experimenting on living animals, has shown that the electrical excitability is more readily destroyed in the abductors than in the adductors.

Clinical and pathological evidence tend in the most unequivocal manner to the same conclusion. This lesser power of resistance in the abductors is a cardinal fact, which it would seem that any hypothesis pretending to explain the preferential paralysis of these muscles must necessarily be reckoned with in advancing any. Again, the peculiarity belongs not merely to the muscle or nerve ending, but to both of these, to the nerve itself, and to its centre in the vago-accessory nucleus. To quote Semon, it would seem 'that there exists an actual difference in the biological composition (*sic*) of the laryngeal muscles and nerve endings, whilst the fact that also in central (bulbar) organic affections, such as tabes, the cell groups of the abductors succumb earlier than those of the adductors, points to the probability that similar differentiations exist in the nerve nuclei themselves. The hitherto obscure phenomenon thus finds its explanation in biological differences between the components of the laryngeal nerves and muscles.' This statement sums up all that was known, and puts the issue very clearly; but it is a question whether the phenomenon is

one whit less obscure for such an explanation. The assumption —for it is either an assumption or the expression is meaningless —of 'a difference in biological composition' takes us no further than a 'different resistance to injury,' and that is identical with the 'proclivity to paralysis' with which Rosenbach and Semon made us familiar nearly eighteen years ago. It seems that the precise difference in this miscalled biological composition, in the first instance, must be found, and then that this difference must be connected, in the way of cause and effect, by the usual methods of observation, experiment, and analogy, with a difference of resistance to injury, before it can be adduced as an explanation of the ascertained facts. Grützner and Limanowsky are disposed to look for the biological difference in the histological character of the muscles; and that Semon's speculations tend in the same direction would appear from his commentary on their statement, 'that this bio-chemical question has to be diligently studied, as it probably contains the final explanation of the different resistance of the glottis-openers and glottis-closers to progressive nerve lesions.' Now it would seem that the prospect disclosed in these words involves an indefinite postponement of a satisfactory solution. The neurologist will reasonably expect to find an explanation of the observed facts in the principles which he believes to obtain elsewhere in the nervous system; and since he has admittedly to deal with an exceptional instance, he will endeavour to account for it by an exceptionally modified causation.

Reverting to the well-established doctrine, that the trophic influence of a peripheral motor nerve and muscle resides in the motor cell with which they are centrally connected, it may perhaps be assumed that a difference in resistance to slowly progressive injury is equivalent to a difference in nutritional vigour; and if such a difference can be shown to exist or can be accounted for in the motor cell, it is in accordance with neurological principles to expect its existence in the peripheral nerve and muscle also. On these grounds, Cagney (*Brain*, Part 60, p. 490) suggested that the true explanation was to be sought in some *distinction, morphological or physiological, between the bulbar centres* for the abductors and the adductors respectively. Such a distinction seemed to be found in the fact that the adductor medullary centre is connected with a higher cortical centre, while no such cortical centre can be found in the case of the abductors. Cagney contended that the negative proposition—namely, the absence of an abductor cortical

centre—finds confirmation in a well-known phenomenon, which is the other great peculiarity in the function of the adductors, an apparent anomaly for which many explanations have been attempted. Referring to the difficulty which existed at the outset of explaining the proclivity of the abductors to paralysis, Semon says: 'A satisfactory hypothesis was prevented by a fact hitherto only casually referred to by Schech, to which my attention had been directed while studying the question of abductor paralysis, when I was compelled to observe accurately the position of the vocal cords during quiet respiration. I found that the usual description of the "rhythmical excursions" of the vocal cords during normal respiration did not apply in the great majority of cases of healthy adults, in about four-fifths of whom the glottis forms an isosceles triangle, which during inspiration is but slightly, if at all, increased, and in expiration is just as little diminished in size. Measurements by means of graduated mirrors, and claimed to be exact, showed that this triangle was two and a half to three times larger than that formed by the glottis after death ("cadaveric position" of the vocal cords). This greater width of the glottis during life, which was not easily explicable *primâ facie*, certainly seemed to point to a greater strength of the abductors in comparison with the adductors, and the fact that these apparently stronger muscles should more easily succumb than the adductors to organic lesions became the more mysterious.' In a paper read before the Royal Society in 1890, Semon produced an explanation of this phenomenon, referring it to a reflex tonus of the posterior crico-arytenoid; but it seems possible to bring this over-action of the posterior crico-arytenoids into line with other well-known neurological phenomena. According to Cagney, it resembles the condition witnessed in the muscles of a limb when their spinal nuclei have been for some time cut off from connection with their cortical centre, as in lateral sclerosis or in the late rigidity of hemiplegia. Thus regarded, it is the negation of the control which the fibres in the pyramidal tract are universally believed to exercise upon the spinal centres with which they are connected.

The absence of a cortical area may also be held to account for the nutritional defect which finds its expression in the abductor proclivity now under discussion. This question is considered at length by Cagney, and the position he maintains is strongly supported by the observations amongst others of Babinski, and by the experiments of Richet and Raymond. The association of abductor tonus and abductor proclivity, the two remarkable

peculiarities of the laryngeal system, with a single cause which seemed itself to be at once anomalous and adequate to account for both of these, had a fair claim to be regarded as a statement of the biological differences of which Semon spoke. The explanation, however, holds good only in so far as the belief is good that there is no abductor cortical area, and quite lately (1895), at the meeting of the British Medical Association in London, Risien Russell demonstrated, apparently with success, that this centre so long fruitlessly sought for did in fact exist, and could be stimulated by a method which he devised. Assuming what is probable, that other observers are to confirm the results obtained by Russell, it may still appear that the difficulty and delay with which this new fact has been acquired depends upon central peculiarities, not incomparable to the complete absence of a cortical area for the abductors — in other words, that the 'biological difference' is a central nutritional inadequacy of the kind postulated by Cagney's hypothesis. This view has something in common with that of Bosworth, and yet is in marked contrast with it. The latter authority, who would seem to convey that abductor paralysis is of its nature bilateral, believes that the condition is due to central disease. He argues with much force as to the probability that there is a separate ganglionic respiratory mechanism, and he points to the frequency with which abductor paralysis has been found in association with tabes. The production, however, of the paralysis by pressure upon the laryngeal nerves, which Bosworth himself concedes as a fact, is fatal to the hypothesis of central disease; whereas the arguments he advances may be used to support the view of central nutritional inadequacy —a physiological, not a morbid, peculiarity. In considering the subject of laryngeal paralysis as a consequence of cerebral lesions, exceptions will be taken to the assumption that an abductor centre and a respiratory centre are in any sense the same, and it remains still true that the respiratory functions can be maintained in the absence of the cortex, and even of the basal ganglia. Whatever force formerly belonged to the contention that the abductors were without cortical control, so far as experiment could show, this must still hold true in so far as they subserve the function of respiration apart from voluntary influence, and in the same measure they may be thought to be dependent nutritionally upon the medullary ganglia alone. Semon, in criticising Cagney's view, refers to the result of certain experiments upon animals under ether, performed by Hooper and repeated by Horsley and himself. From these it appeared that if the

recurrent laryngeal nerves of animals under ether were cut, and the peripheral end stimulated, the reaction varied with the intensity of the toxic state produced by the ether,—the cords being adducted when the animal was slightly, and abducted when it was profoundly, etherised. Semon urges that the different behaviour to ether of the abductors and adductors under these circumstances, implies a peripheral, not a central, difference of constitution. But it is already conceded on clinical grounds that there is a peripheral distinction. It is Cagney's contention that the peripheral depends upon a central distinction. It is stereotyped during life, and it cannot be supposed to disappear when the central connection is severed.

It will be borne in mind that the proclivity of an abductor muscle to paralysis, whether a fact or, as others have contended, a semblance, holds good whatever the cause of paralysis, whether central, median, or peripheral in its incidence, and whether the paralysis be one-sided or bilateral. The peculiarity, therefore, confers its mark upon the symptoms in all of these cases.

[I am glad to have had the opportunity of giving insertion to so able and impartial a discussion of this question, nor do I grudge the space, although it must be admitted that the interest of the subject is academical rather than clinical.

While acknowledging the *facts* elucidated by Sir Felix Semon, I cannot but agree with the hesitation evinced by Professor Schroetter at the Nottingham meeting of the British Medical Association, of acceptance of them as establishment of a '*law*,' for, as the Professor said on that occasion, laws in medicine are, above all other laws, most liable to exceptions.

It may just be added that in the present year Dr. Grossman of Berlin has reopened the matter, and has published several articles with the intention of demonstrating that neither the 'law' of Semon nor the theory of Krause can be longer considered or maintained.

It is evident, therefore, that Semon's interpretation of the clinical phenomenon is not yet universally accepted.

English readers will find a very complete review of this latest controversy in the *Journal of Laryngology* for May 1898, from the pen of Dr. John Macintyre.—L. B.]

The causes of injury to the recurrent laryngeal nerve are various and very numerous, a fact dependent upon the long course of the nerve in the thorax and in the neck, and its exposure anatomically to manifold risks. It has been injured in the course of surgical operations, but the commonest lesion is that due to pressure from morbid growths. Of these, aneurysm, enlarged mediastinal glands, cancer of the œsophagus or neighbouring parts, abscess, and gôitre may be mentioned. The left nerve suffers more often than the right,—in the proportion of about two cases to one. Mediastinal tumours and aneurysm of the aortic arch contribute largely to this. The right nerve has been paralysed by pressure derived from tubercular pleuritic

material deposited on the apex of the lung. Both nerves are simultaneously injured most often in cases of thyroid tumours, cancer of the œsophagus, caseous mediastinal glands and multiple aneurysms at the base of the neck. E. Fränkel has recorded a case of bilateral paralysis from pressure by a very large aneurysm of the aorta, and Baumler one caused by pericardial exudation. The recurrent laryngeal nerve supplies all the intrinsic muscles of the larynx. The effect of paralysis of the nerve may therefore be extreme. It will readily be understood that the symptoms and severity of the condition will differ greatly according as the affection is unilateral or bilateral. It seems unnecessary to follow the example of other writers, and discuss these two cases separately. Essential differences, however, occur according as the paralysis is incomplete or complete.

1. **Incomplete or abductor paralysis** (Fig. 123, PLATE XIV.).—The *symptoms* are most typical in bilateral paralysis. The effect is then closure, almost complete, of the glottis, giving rise to dyspnœa and stridor, most marked during sleep and greatly aggravated by accidental irritation. Difficulty is experienced chiefly during inspiration; dyspnœa may be so great as to call for the operation of tracheotomy. There is not necessarily any cough, and the voice is unaffected in most instances. In bilateral abductor paralysis the laryngoscope shows the glottis narrowed to a mere slit (not an ellipse as in paralysis of the thyro-arytenoids), and as a further characteristic it is often seen that this narrowed opening is smaller during the inspiratory than during the expiratory act. Various attempts have been made to explain this. The phenomenon is probably due to the unopposed synergic action of the adductors, or it may be purely passive, the effect of the air-pressure from above. The *subjective symptoms* — embarrassed breathing, stridor, and dyspnœa—are not prominent where the paralysis is one-sided (Figs. 124 and 126, PLATE XIV.). The affection is then made evident by the laryngoscope. The mucous membrane over the affected cord is usually congested. The cord during respiration is fixed in the middle line, or in the cadaveric position, if there be associated impairment of adduction. This occurs most often in cases due to glandular enlargement and to syphilitic deposit. Whatever the cause, with its extension, the paralysis tends to pass over to the complete form.

Prognosis.—A serious opinion must be given in every case of this nature, since the disease which gives rise to it is so frequently of a fatal character. It is probable that formerly the

prognosis was often unnecessarily grave, but the contrary fault seems in danger of being now committed. Cases do, however, every now and then come under notice, in which the paralysis assumes a chronic and remittent form.

CASE CLXXII.—Such a one occurred in my practice in the instance of a lady, æt. 53, first seen in August 1873, who suffered from occasional severe attacks of hoarseness and dyspnœa. On laryngoscopic examination, congestion and paralysis in abduction of the left vocal cord was observed. There was also dulness both in front and behind, about the root of the lung. I had the advantage of a consultation with the late Sir Richard Quain, and the affection was diagnosed to be due to enlarged bronchial glands pressing on the recurrent nerve. Under treatment by external counter-irritation, and the internal administration of the iodide of iron, the patient greatly improved, and has only had two severe relapses, one having occurred six years after she first came under notice, though there has always been some exacerbation on the occurrence of catarrhal or general debilitating influences.

2. **Complete paralysis of the recurrent** (Fig. 125, PLATE XIV.).—This condition in its bilateral form implies the loss of function of all the intrinsic muscles of the larynx. The action of the adductor being withdrawn, dyspnœa disappears. The inability to properly approximate the cords introduces difficulty of phonation. This is the symptom which is most obtrusive to the patient, and is most marked when the affection is bilateral. Physically, on the other hand, the paralysis of a single cord is the more obvious. Seen with the laryngoscope during quiet respiration, nothing unusual is observed, but when an attempt at phonation is made the paralysed cord remains in a position intermediate between that of phonation and inspiration (cadaveric position) (Fig. 126, PLATE XIV.). If both cords be paralysed, both retain the cadaveric position, and the arytenoids are similarly motionless. When, however, it happens that one is affected, a compensatory overaction of the healthy cord often takes place (Fig. 126); it passes the middle line and comes more or less accurately in apposition with its fellow during phonation. In effecting this movement the arytenoid cartilage of the uninjured side lies somewhat in front of the other.

Paralysis from injury to the pneumo-gastric.—This may be the result of many of the causes noticed in connection with recurrent paralysis; or it may be induced by a fracture at the base of the skull. Laryngeal *symptoms* occur only when the injury involves the fibres of the recurrent laryngeal nerve. They may be the symptoms of recurrent laryngeal paralysis alone, or, if the injury be above the point of divergence of the superior laryngeal, —a condition very rarely met with,—there will be added impairment of sensibility and appearances attributable to implication of

the crico-thyroid muscle. Such a case is recorded by H. Moser. *Laryngoscopically*, the affected cord maintained the cadaveric position; during quiet respiration the border of the epiglottis on the paralysed cord was raised above the level in phonation, the paralysed cord was shorter than the healthy one,—an effect of paralysis of the crico-thyroid and loss of its tensor function, —and in the moment of adduction the arytenoid of the healthy side passed, not in front of, but behind, the other, and on a lower plane.

Paralysis from injury to the spinal accessory (vago-accessary). — The spinal portion of the spinal accessory nerve contains the fibres destined for the innervation of the larynx. Injuries to this nerve are usually complicated by the implication of other cranial nerves. Many cases, supposed to have been of this nature, are recorded. The *diagnosis* is generally based upon the coincidence of laryngeal paralysis with paralysis of the sterno-cleido-mastoid and trapezius muscles of the same side and of the corresponding half of the soft palate. Stephen Mackenzie has reported two such cases. Accurate information, founded upon the result of autopsies, is still needed.

Paralysis from multiple neuritis.—Amongst the causes of this affection may be enumerated diphtheria, poisoning by alcohol, lead, and arsenic, syphilis, tubercle, and tabes. The incidence of paralysis is very variable. The distribution of one or more nerves may be involved either wholly or partially, and the nature of the lesion itself is subject to notable differences. Thus autopsies have shown that in cases of tabes the laryngeal symptoms may be accounted for by a wholesale degeneration of the peripheral nerves; while in connection with diphtheria there is commonly found an actual inflammation of these structures, leading to swelling, tenderness, and hyperæmia, with multiplication of nuclei and segmentation of the myeline leading to a greater or less destruction of the axis cylinders. Pathologically, it is very doubtful whether the two processes contrasted here should be classed together; but for clinical purposes their consideration may be taken together. Tabetic changes are found most often in the recurrent, while diphtheria selects especially the superior laryngeal nerve.

The recognition of laryngeal neuritis depends upon the clinical history, the absence of central lesions, and of injury to the nerve trunks; the *symptoms* are mainly, especially in the case of diphtherial neuritis, areas of anæsthetic paralysis which is atypical in its incidence and extent. The condition is associated with tenderness on deep pressure, laterally about the level of the cricoid

cartilage, wasting of the muscles supplied by the affected nerves: investigation has shown the abductors are prone to suffer most and earliest in this way. The detection of such atrophy is, in practice, difficult or impossible, and it may be added that the electrical reactions can seldom or never be obtained so clearly as to throw light on the question of diagnosis. The tests are the same as for the detection of neuritis in other situations. Electrical changes, if observed, would be valuable evidence when bulbar changes and injury to nerve trunks can be excluded.

PARALYSIS FROM BULBAR DISEASE.

Disease of the medulla oblongata involving the nucleus of origin of the laryngeal motor nerves may be more or less extensive, and may cause either one-sided or bilateral paralysis. The latter, as a result of systemic diseases of the medulla, is much the commoner. Tumours, syphilitic or other patches of inflammation or softening, and small hæmorrhages, may be limited to one side; but will generally also involve injury to neighbouring nuclei of origin, with a correspondingly extensive *symptomatology*. Wasting and atrophy of the muscles of one vocal cord are sometimes associated with hemiatrophy of the tongue; and this has been noted especially in connection with vascular changes in syphilis. Lesions of this kind, when they involve the nuclei of both sides, are nearly always rapidly fatal, and opportunity for studying them is wanting. Certain degenerations also, and notably tabes, may for a time produce symptoms on one side only, and the resulting paralysis is sometimes abductor only, at others complete recurrent paralysis.

Paralysis due to local disease of the medulla may or may not be accompanied by anæsthesia, and the implication in the paralysis of other parts besides the larynx is common, the tongue, pharynx, and soft palate being most apt to suffer.

Lesions other than local of the medulla result most frequently in bilateral paralysis. They are usually chronic, and belong to the class of system degenerations.

Post-diphtherial bulbar changes of rapid development sometimes occur, whether as an extension upwards from the nerve roots, or from the action of the poison primarily on the medulla, and Guthrie maintains that this is frequently the cause of a fatal crisis in children.

Glosso-labio-laryngeal palsy results from a degeneration in the grey matter of the medulla corresponding to that of the anterior columns of the cord, and may precede, follow, or be

accompanied by progressive muscular atrophy. It is unattended by sensory impairment, but the loss of the pharyngeal and laryngeal reflexes may be an early incident in its course. The laryngeal paralysis usually develops later than that of the tongue and lips, and the atrophy and weakness of those parts is usually an available guide in diagnosis. The abolition of reflexes may give rise to fatal accidents from suffocation or broncho-pneumonia set up by the passage of food within the air passages before paralysis is very advanced. It tends, however, to be complete and bilateral, the initial abductor paralysis passing gradually to the condition of immobility of one or both cords in the cadaveric position.

Disseminated sclerosis as a rule involves the medulla. The characteristic speech implies the implication of the laryngeal nucleus, and the cords as seen with the *laryngoscope* are insufficiently adducted in phonation, and are slow, tremulous, and uncertain in their movements. The *symptoms* are nearly always bilateral.

Tabes is perhaps the form of degeneration which most commonly invades the laryngeal bulbar nuclei. The resulting paralysis may be unilateral or bilateral, incomplete or complete, but in no other condition is the abductor proclivity more clearly marked. The tendency of the disease is undoubtedly progressive, and paralysis of an abductor seldom fails to issue in complete recurrent paralysis. Sometimes, however, in a tabetic patient one cord may be seen to be fixed in adduction and the disability will pass off. Paralysis may co-exist with laryngeal crises, or with any other of the incidents of the disease. It occasionally precedes all other symptoms. The pathology of laryngeal tabes is complex, and it is probable that peripheral neuritis, as well as degeneration of the bulbar nuclei, is concerned in the production of its symptoms.

Paralysis from Cerebral Lesions.

Much controversy has taken place round the question as to whether lesions of the cerebral cortex or of the motor tract underlying it in the internal capsule is the cause of laryngeal paralysis. A number of reputed instances have been recorded, but in the majority of them either a laryngoscopic examination to attest the paralysis was wanting, or else there was no autopsy to place the pathological condition beyond doubt. There are, however, a few cases in which these wants were supplied, and in which the evidence connecting paralysis with a cerebral lesion as its cause had

all the strength and completeness which commonly attaches to this kind of investigation. The facts, notwithstanding, have been questioned and the inferences based upon them impugned by certain writers whose criticism has been in part of a deductive or *pseudo a priori* character. The matter is important, and it seems necessary to consider shortly what are the extent and the grounds of present knowledge concerning it.

The distinction between the two functions of voice and respiration is fundamental. Taking cognisance of this, Ferrier and Duret conceived that a centre for phonation must exist in the cortex, but they failed to find it. Krause, however, localised a point upon the antero-external surface of the prefrontal gyrus, stimulation of which in the dog caused bilateral adduction of the vocal cords. The existence of such an area, although disputed by Franck and others, has been confirmed by independent investigation, and Krause's adductor area has come to be considered and spoken of as the cortical 'centre' of phonation, or by those who distinguished more accurately, as the centre for the laryngeal part of the act of phonation. This generalisation has unquestionably influenced the subsequent discussion. It was based on the assumption that the movement of adduction being indispensable to the production of sound, was in some degree its congener or equivalent. Abduction, on the other hand, the normal accompaniment of inspiration, was thought of similarly as the equivalent of respiration. The respiratory act was known to be under the control of the medulla, and, in some animals, the entire cortex or the brain itself as low as the floor of the fourth ventricle may be removed without suspending that function. It was therefore no matter for surprise that repeated and unceasing research had failed to disclose any cortical area, stimulation of which caused abduction. Strictly speaking, it is an abuse of the method of experiment to found upon it a negative generalisation; or to predicate of anything that because it is not known, therefore it does not exist. The utmost that was warrantable was that, in view of the thoroughness of the search for an abductor area, none would be found by the methods hitherto used for its detection. Inference, however, passed far beyond this. Not only was it held to be established that there was no cortical area for abduction, but the fact lent itself to further confusion of the ideas connecting abduction with respiration; because, when it was known that respiration could proceed after extirpation of the cortex, and when it was believed that abduction was nowhere represented in the cortex, it was easily assumed that those two

were very closely related indeed. The first part of the fallacy—that as to the non-existence of a cortical area, stimulation of which causes abduction — has been disposed of by Risien Russell, who, adopting a new method, clearly defined such an area situated in the dog below and in front of Krause's area, from which it is separated by the supra-orbital sulcus. As to the relation between abduction and adduction respectively, and the two functions of the larynx, the case is by no means self-evident, but is perhaps one of the most complicated of a class of problems our knowledge of which has hardly begun. The doctrine emphasised by Hughlings Jackson, that the higher centres are not centres for the innervation of muscles but for the organisation of movements, needs to be borne closely in mind. It is probable that the cortical, the highest level, centres are extremely far-reaching in their control, and that they act by stimulation or by inhibition, or by both, over a widely distributed muscular system.

How wide and how extensive this system must be in the case of breathing or speaking, is apparent on a moment's reflection, and the localisation of the true respiratory or phonatory centre is correspondingly remote. There is no warrant whatever for conferring such a character upon the areas now localised; and it is desirable that the terms used in describing them should be narrowly restricted. It is still more desirable that an abuse of these terms should not be an instrument in the criticism of duly recorded clinical facts. The discovery of a cortical area, stimulation of which causes abduction, does not affect the view long held of the purely organic or vegetative character of the respiratory act, inasmuch as that act itself can be influenced by the will; and inspiration, a part of which is abduction, is an antecedent or accompaniment of many voluntary acts. It needs but to mention that speech being essentially an endowment of man, the application to the purpose of clinical reasoning of facts discovered by experiments upon animals must be made with more than usual caution.

The question, then, as to the dependence of laryngeal paralysis upon cerebral lesions must be decided mainly, if not entirely, by clinical experience. It has been said that a great number of reputed instances are justly open to doubt, upon the ground of insufficient observation. Garel and Dor have published two cases, and Déjerine two more, in which these authors observed a paralysis of one vocal cord as a result of cerebral lesions, verified by autopsy, and in which they had excluded to their satisfaction any lesion of the medulla or motor nerves com-

petent to produce the symptoms. In one case, that of Garel, the lesion was cortical, and due to a cerebral hæmorrhage involving the lower part of the third frontal convolution of the *right side*. There was paralysis of the *left vocal cord*. There were lesions also of the left cerebral hemisphere causing right hemiplegia and aphasia. The other three cases showed sub-cortical lesions involving the whole substance of the brain underlying the third frontal convolution in Déjerine's cases, the lenticular nucleus and a portion of the internal capsule in those of Garel and Dor. In each case there was paralysis of the opposite vocal cord. Semon, on the other hand, examined a large number of persons having complete aphasia and right hemiplegia shortly after a seizure, and in no case has he found any paralysis. He and Horsley maintain that 'there is no such thing as unilateral paralysis of a vocal cord from lesion of a cerebral hemisphere,' and they base this opinion upon the experiments that they had performed upon animals. Those experiments have shown that there is in each cerebral hemisphere of such animals an area, stimulation of which by faradic currents causes bilateral adduction of the vocal cords, as Krause had already shown; that the destruction of one of these areas is not followed by paralysis; and that in an animal in which one of the areas has been destroyed, subsequent stimulation of the intact area on the sound side would produce bilateral adduction. Those results are undoubtedly a valuable and important contribution to the study of this subject; and if it is safe to assume that the organisation of the dog or the cat is for the purposes of the experiment precisely similar to that of man, that the ablation of the adductor area by the knife is the same thing as the effect of cerebral hæmorrhage, softening, or embolus, and that stimulation with faradic currents is practically identical with cerebration, they would seem almost to be conclusive. It is not the fault of these observers that doubts upon these points beset this mode of inquiry, when its results are in conflict with clinical manifestations, and they partly recognise the disadvantage; for, though they consider the experiments conclusive, they urge further against Garel and Dor, that the inspection of the medulla *post-mortem* had not been sufficiently minute to exclude the co-existence of bulbar changes with certainty. The French writers, however, do not share this view, and in Déjerine's cases there seems to be no room for the contention. In all four cases it is mentioned that the paralysed cord was fixed in the cadaveric position; and to this Horsley and Semon object that 'the complete paralysis of the vocal cord can in no way be explained by a cortical lesion.' This objection they

base also upon their experiments; and so great a force is it thought to have, that the apologists of the French observers, and amongst them Luc and Raugé, think it easier to assume that the cases had been incorrectly observed than to admit the possibility of this cadaveric phenomenon. This seems to be a remarkable instance of the strength of prejudice. To the statement of the results of their experiments made above, and as formally stated by Horsley and Semon to be the ground upon which they have established their position with regard to this question of paralysis from cerebral lesion, must be added one other fact. 'We could discover in none of the species of animals experimented upon (except cats) an area in the cortex for the abduction movements.' If any importance was thought to attach to this fact of failure to find an abductor area, it must since have disappeared; but it was at any time insufficient ground for the assumption that an abductor area did not exist. But when Semon goes on to expand his statement that a cortical lesion can in no way explain complete paralysis of a vocal cord, he seems to become responsible for a large share of the confusion between abduction and respiration, adduction and phonation. He says 'physiological and pathological experience has shown that in the cortex of man and of the higher animals, so far examined (except the cat), not the respiratory but only the phonatory function of the larynx is specially represented. Thus, even if, according to Masini's view, an isolated cross effect could be exercised from one phonatory centre, the *vocal* but not the *respiratory* function of the larynx would suffer, the latter being mainly if not exclusively governed by the medulla. The *absolute immobility* of the vocal cord, therefore, cannot possibly be traced up to a cortical lesion.' The mention of a fact in connection with the cat here seems to assure the reader that he may, without injustice to the author, substitute *abductor* for *respiratory*, and *adductor* for *phonatory*. If the substitution is not to be justified, he will inquire in what respect anatomical and pathological experience concerning the cat is at variance with that concerning the rest of the higher animals; and if it is justified, it must follow that now that an abductor area has been shown to exist as generally as an adductor, the principal statement is no longer true, the respiratory function is no longer governed mainly by the medulla, and the objection itself falls to the ground. There is no need to dwell at greater length on the inexpediency of treating of adduction and phonation as if they were the same thing, or as if their presiding centres were identical, and we must hold ourselves to be a long way from the possession of generalisations of this sort, such

as will afford a secure light for the analysis of clinical facts. It is safer for the present to take these latter on their merits, and if credible authorities vouch for their manifestation, to receive them provisionally as true, even though they seem so unaccountable as cadaveric rigidity in connection with cerebral lesions. On the score of clinical experience alone, it is only the scantiness of the material which permits of any doubt that unilateral paralysis may be due to a one-sided cerebral lesion. Semon's statement that he has examined a large number of hemiplegic and aphasic subjects with a negative result is worthy of all respect, but again in the case of negative results the judicious attitude is one of expectancy. As he himself says, aphasia and aphonia are not identical, and assuredly hemiplegia is distinct from both; and Semon's observations upon this head have the weakness which he justly charges against those of earlier authorities,—that is to say, they are unsupported by post-mortem examinations.

Functional Aphonia—Hysterical Paralysis (Fig. 121, Plate XIV.).

Complete loss of voice is occasionally experienced after recovery from certain diseases which impoverish the blood. The history of many other cases is that of enfeeblement from long nursing of a sick relative, and similar causes, tending to produce at the same time bodily weakness and mental prostration. We cannot agree with Mackenzie that 'it far less commonly occurs in connection with amenorrhœa than might be supposed from the writings of some authors,' for, according to our experience, amenorrhœa or dysmenorrhœa is the more frequently co-existent uterine condition, and the most favourable periods of life for its occurrence in females are at the commencement and on cessation of menstruation. Allusion has been made in the chapter on laryngeal phthisis to the frequent recurrence of functional aphonia as a premonitor of that disease: in such a case, it is a question whether enfeeblement of breath-motor power or local anæmia is the principal factor. It is certainly the former in the later stages of laryngeal tuberculosis, to which is added the separation of the arytenoid cartilages by tumefaction. Functional aphonia is much less frequently purely hysterical than is generally considered, and the term 'hysterical loss of voice' but too frequently represents a want of inclination or ability to find out the true cause. It not uncommonly occurs on the subsidence of a laryngeal catarrh, and it is occasionally produced by sudden fright.

Whitfield Ward, in a very suggestive though brief paper, has usefully drawn attention to the circumstance that 'paralysis of adduction may be subdivided into three forms, namely, a paresis of the arytenoideus (Fig. 128, PLATE XIV.), a paresis of the crico-arytenoidei laterales, and lastly, paresis of the arytenoideus and crico-arytenoidei laterales combined.' We do not quite follow this author when he says that 'the arytenoideus muscle is the principal agent in the production of the affection styled paralysis of adduction; for it must be remembered that the arytenoideus, when acting independently of the crico-arytenoidei *laterales*, exerts but a partial influence on *adduction*; on the other hand, when acting in concert with the crico-arytenoidei *postici*, its movement is distinctly that of *abduction*.

SYMPTOMS.—The *voice* is simply *lost*, or absent, but involuntary acts, such as *coughing* and *laughing*, are *phonetic*; when the aphonia is the result of catarrhal conditions, however, these sounds are more or less hoarse. In purely hysterical cases, there is frequently corresponding functional paralysis of the lips and muscles of *speech*, constituting functional loss of speech as well as of voice, and there is a degree of anæsthesia, especially about the vestibule and epiglottis. There may also be stigmata in other parts of the body. The *respiration* is often somewhat hurried, and if the affection be allowed to remain long untreated, the lungs are liable to suffer. Other functional acts are unimpeded, and there is an entire absence of *pain*.

LARYNGOSCOPIC EXAMINATION shows that on attempted phonation the vocal cords do not approach the median line. There is also generally witnessed some diminution in the power of separation when the patient attempts to take a deep breath. Absence of any new formation or other mechanical impediment to approximation of the cords, will complete the diagnosis. The mucous membrane is generally pale in colour, though in catarrhal cases its hue may be deepened.

PROGNOSIS.—Recovery from this condition, under suitable treatment, is for the most part speedy, though every now and again one meets with an instance obstinate to all efforts; in relation to life, the most favourable opinion may be given, though the possibility of a tubercular tendency must not be lost sight of.

TREATMENT.—If stimulating inhalations, general tonics, and change of air fail, faradisation should be employed. In many cases, if the current of one pole be applied to the back of the tongue, and the other over the thyroid region, the voice will be restored; but when this does not avail, there should be no hesi-

tation in introducing the electrode within the larynx. These applications should be continued daily till the voice is permanently restored.

Those hysterical cases are without doubt the more intractable in which a lengthened course of toying with this valuable therapeutic agent has been indulged in; for no better word can be employed to designate the long-continued use of external galvanism applied by the patient or by friends. Allusion has been made to the diminished sensibility of the larynx in purely hysterical cases; but care must be taken, in applying the current for the first time, that the power be not too strong, lest the fright thereby induced serve only to increase the malady intended to be relieved. Of this I have seen several examples.

In many cases strong moral influence is necessary to prevent the voice, once restored, from lapsing back to the whisper, an event which may be considered as the result of habit of the larynx. In some instances in which aphonia occurs at the menopause, there is occasionally some functional dysphagia, associated also with neuralgia; in these cases the electric bath and the constant current may be employed in addition to topical remedies.

Unilateral paralysis of adductors (Fig. 122, PLATE XIV.). —'This rare condition may be due to chronic toxæmia, lead, arsenic, diphtheria, etc.; may result from cerebral disease, or may be caused by cold or muscular strain; and is met with after small-pox, in constitutional syphilis, and in phthisis' (Mackenzie).

SYMPTOMS.—Unless the brain be affected, loss of voice or hoarseness is the chief functional sign; but the acts of coughing, sneezing, and laughing are also aphonic or of diminished phonetic power. Difficulty of swallowing is sometimes experienced.

With the **laryngoscope**, the affected cord is seen, on attempted phonation, to be immobile, and to remain in the cadaveric position while the healthy cord acts freely. There is the same diminished power of abduction as in the bilateral paralysis. The only point of value in diagnosis is the possibility that the inaction may be due to perichondrial inflammation, the swelling in this condition being often beneath the vocal cords, and liable, therefore, to pass unnoticed.

Prognosis is favourable when the cause is local.

TREATMENT.—Faradisation is of great value in toxæmic cases, and should be accompanied by stimulant inhalations and tonics.

Myopathic Muscular Wasting.

A destructive lesion anywhere in the course of the nerve tract between the motor cells of the medulla and the periphery in the larynx, has necessarily for one of its consequences degeneration and wasting of the muscular fibres. There are commonly met with other cases in which, while the nervous elements are intact, the muscular fibres suffer primarily, lose tone and degenerate. This happens usually in connection with prolonged and repeated catarrh of the overlying mucous membrane, and the muscles which most commonly suffer are the posterior crico-arytenoid, the arytenoid, and the thyro-arytenoid. Further, it is especially in anæmic and weakly people that this form of muscular atrophy takes place, and Gougenheim and Tissier have directed attention to the very great frequency with which it attacks the posterior crico-arytenoid in tubercular subjects. The precise association between the catarrh and the paralysis is doubtful; it is almost certain that the atrophy is something more than that of disease. It may be due to infiltration by waste and perhaps poisonous substances derived from the inflamed mucous membrane, or it may be a form of terminal neuritis depending upon a toxic blood state of which the catarrh is either an incident or a joint effect. Many kinds of anæmia are such toxic states, so tubercle is a recognised cause of neuritis; and it is worthy of note that the posterior crico-arytenoid which is the first muscle to fail in bulbar disease and recurrent compression, is here again conspicuous by its liability to suffer.

Whatever the connection between the atrophy and the catarrh, it is always important to take measures to restore muscular tone. There is no condition in which local treatment, and especially electrical stimulation, is more imperatively demanded. Neglect to apply it is attended, in innumerable instances, with a train of chronic disorders which end only with life.

The Diagnosis of Laryngeal Paralysis

is mainly a deduction from the laryngoscopic appearances presented by the various forms of paralysis, of which we have treated hitherto on a pathological basis. It will be borne in mind that the various morbid conditions just described may produce, one as well as another, the same form of paralysis.

The form of the paralysis may be recognised by the **laryngoscope**; its cause and nature must be sought by other means

as well, and a large part of the act of diagnosis consists in this further step, since by its means not only is a prognosis secured as it affects the functions of the larynx, but very often it serves for the recognition of a formidable disease, directly threatening life and urgently calling for general as well as local treatment.

The task of presenting briefly and comprehensively a view of the various paralyses clinically distinguishable, is attended with difficulty. It is necessary to mention in the first place that paralysis of a muscle may differ in degree from slight paralysis to total loss of function. Again, though we are compelled to speak of paralyses of the vocal cords on account of the prominence of the appearances implied and the relative inscrutability of the elements of muscular disablement which bring them about, this term, if convenient, is, strictly speaking, incorrect. It has a clinical value only. In this sense a vocal cord may be completely paralysed from a loss of function of all its muscles, or it may be disabled in certain movements from a loss of function of some of them, and this again may be total (paralysis) or partial (paresis); and further paralysis of muscles and contractures of antagonists may be ordinarily blended in the production of the same morbid appearances. Setting aside the differences of opinion which exist as to the muscular mechanism of the larynx, it is clearly impossible in a clinical treatise to deal with all these combinations separately, and it follows that in the interpretation even of typical instances there must always be room for individual acumen.

The morbid conditions of common occurrence to be recognised by the laryngoscope are the following:—

1. Immobility of both cords in adduction (bilateral paralysis of adductors); 2. Immobility of one cord in the cadaveric position (unilateral recurrent paralysis); 3 and 4. Immobility of one or of both cords in adduction (unilateral or bilateral abductor paralysis).

1. **Bilateral adductor paralysis** (Fig. 121, PLATE XIV.).—In a case where the laryngoscope displays this condition, the subject being hysterical or anæmic, and if a female suffering from amenorrhœa, it will nearly always be found that the paralysis is functional. In any case it is necessary only to exclude a recent attack of diphtheria. This can be done by the history, whilst the absence of accompanying paralyses of the palate, pharynx, and ocular muscles especially, is very significant.

2. **Unilateral recurrent paralysis** (Figs. 124 and 126, PLATE XIV.).—From what has been said in the preceding pages, it will

be seen that this condition may result from a destruction anywhere in the motor tract from the cortex to the periphery. The length and extremely complicated relations of this tract will leave room in difficult cases for an immense choice in localising the lesion and in discriminating its character. The cases already mentioned of Garel, Dor, and Déjerine are instances of a kind which, if their observations are confirmed, is destined to increase rapidly with the closer and prompter attention assured in the future. If we are to accept these cases at all, we must accept them in their entirety; and since fixation of the cords in the cadaveric position has been noted, they fall within the present category. The diagnosis of a cerebral lesion would not be made on the ground of a laryngeal paralysis alone, and the occurrence of such an incident is hardly conceivable. Other symptoms will invariably be present. They will be those indicating cerebral hæmorrhage, tumours, emboli, softening or syphilitic degeneration of cerebral vessels. The lesion may be cortical or subcortical, and in either event it should be possible to localise it in the neighbourhood of the third frontal convolution, or in the fibres passing thence through the internal capsule, crus, and pons, to the medulla in the floor of the fourth ventricle. In case of doubt, electrical tests should be carefully applied by an endo-laryngeal electrode. The explanation is difficult, but if a morbid reaction can be clearly shown, the presumption of a cerebral cause is negatived.

Disease of the medulla itself is a common cause of recurrent paralysis, and of this class tabes plays a prominent *rôle*. The characters of the disease may be shown by concomitant symptoms; but since laryngeal paralysis is often the first symptom displayed, this aid may be wanting and the importance of a correct diagnosis is the greater. Under such circumstances the paralysis is less often complete than that of an abductor only, and since there, the voice is unaffected the opportunity of examination rarely presents itself. Unilateral paralysis is rare in progressive muscular atrophy, and hardly known in disseminated sclerosis. Focal lesions of the medulla are competent to cause it.

By far the commonest cause of this condition is compression in some part of their course of the vagus and recurrent laryngeal nerves, and search should first be made in all cases as far as possible to ascertain or to exclude trouble of this kind. Tumours of the neck or of the thyroid, enlarged glands, tubercular and syphilitic deposits, are easily detected. Tumours of the mediastinum offer more difficulty. The commonest of these, aortic aneurysm, is often latent for a long period after alteration of the

voice and laryngoscopic appearances present themselves, to suggest the possibility of its existence. Exploration of the neck proving negative, a careful examination of the chest must be made. Enlarged glands, syphilitic or cancerous growths in the mediastinum, the signs of aneurysm, pleuritic exudations, and—especially in the case of a right-sided immobility—tubercle at the apex of the lung, may be found to account for the paralysis.

Finally, peripheral neuritis may be the cause of the paralysis, and this is the more probable in connection with diphtheria, syphilis, and lead poisoning. A class of cases in which the paralysis is of this character, and in which the usual antecedents have been *absent*, are described under the term **paralysis a frigore.** They are thought to be due to the direct influence of cold or chill, and to occur in rheumatic persons.

In all cases of peripheral neuritis, information of greater or less value may be obtained by means of the electrical reactions. If these are normal in character and energy, not only peripheral neuritis, but all other nervous causes excepting hysteria and cerebral lesions, are excluded. If all reaction is suspended, bulbar disease of some duration or compression of the nerve is probable. If, however, excitability is increased and galvanic nodal changes are observed, and especially if galvanic treatment is attended with progressive benefit, the disease is most likely to be peripheral neuritis.

It is in these cases especially, but in all others necessary, in estimating the cause of an immobility of a vocal cord, to exclude or allow for local changes, such as syphilitic infiltration of the mucous membrane, inflammation of cartilages, ankylosis of the arytenoid joints, and other conditions which may modify the appearance of the glottis or hamper the movement of the cords.

3. **Unilateral abductor paralysis** (Figs. 124 and 126, PLATE XIV.).—This condition generally represents an early stage of the preceding, because, as we have seen, the abductor muscles possess the remarkable property of tending to lose their function earlier and more quickly than the other muscles supplied by the recurrent laryngeal nerve, as a consequence of any injury telling equally on all. Moreover, the slower and more progressive the causal injury, the more marked in time and degree is the preferential paralysis of the abductor. It is doubtful whether cerebral lesion can be the cause of this condition. Clinical evidence is wanting, and it is improbable. The causes, therefore, are in general either bulbar disease or compression. If it be bulbar disease, in the immense

majority of cases it is tabes, but inasmuch as tabetic changes are diffuse, they more often produce bilateral paralysis, and also as one-sided abductor paralysis produces no subjective symptoms, unilateral abductor paralysis of tabetic origin is rarely met with. In most instances which are brought under notice, a source of compression will be diligently sought for. Where found, and if of a progressive character, two inferences result—that the tumour has but slightly implicated the nerve, and that with its progress the laryngeal paralysis tends to be complete.

4. **Bilateral abductor paralysis** (Fig. 123, PLATE XIV.).—This is essentially the product of tabes, and in connection with it the other symptoms of that disease should be looked for. It may or may not be accompanied by laryngeal crises. Visceral crises may also be present; diminished knee-jerks, diplopia and ptosis, Argyll-Robertson pupil, visceral crises and neuralgic pains, or any of these, may attest the nature of the malady. Again, all these may be absent, and the paralysis alone mark the disease. In this case also but little doubt as to its nature can exist. Other diseases of the medulla, such as disseminated sclerosis and progressive muscular atrophy, may be thought of, and compression of the recurrent laryngeal nerves by a single or by multiple tumours can produce the symptom, but since these tend to complete recurrent paralysis, it is a rare coincidence to detect their initial effects simultaneously on both cords. Complete recurrent paralysis is seldom bilateral, for the reason that death from invasion of the air passages or some other cause usually takes place before it is established. In glosso-labio-laryngeal palsy (progressive muscular atrophy) this condition may be attained or approached if life be prolonged (Löri, Krause). Such a paralysis may also be due to compression.

The commoner condition in cases of bilateral paralysis owning a central (bulbar) or peripheral cause is incomplete (abduction) of one, and complete of the other, cord. The exciting causes are the same as in the cases just noticed, but the lesion is more advanced on one side than the other, and the sphincter function of the glottis, persisting in a more or less imperfect degree, death from suffocation is less imminent.

There remain for consideration certain paralyses of another class. They are paralyses of individual muscles, namely, the crico-thyroid, arytenoideus, and thyro-arytenoideus. Paralysis of these muscles is sufficiently familiar clinically, but their study presents difficulties which have led to differences of interpretation by various authorities.

5. **Paralysis of the crico-thyroid.**—The independent paralysis of the crico-thyroid has been described by Von Ziemssen and Morell Mackenzie as a result of diphtheria, by Major and R. Heymann as due to peripheral neuritis from chill, and by Newman following a wound of the neck. There are three pairs of muscles whose action is directly concerned in producing tension of the cords in phonation, namely, the crico-thyroid, crico-arytenoideus posticus, and thyro-arytenoideus. Diminution of tension is therefore one of the results of paralysis of the crico-thyroid. The muscle is also an agent in adduction. The voice is hoarse. Laryngoscopically, the cord of the paralysed side is on a lower level than its fellow. If the affection be bilateral, one cord is usually more impaired than the other. In a case of Heymann's, where there was paralysis of both superior laryngeal nerves, the appearance of the glottis as figured by Bosworth was remarkable. Its anterior portion formed an ellipsis bounded posteriorly by the vocal processes in apposition, while behind this was a triangular interval, separating the arytenoid cartilages. The appearance described by Ruault is similar. Mackenzie describes the outline of the cords as sinuous (but this observation, although generally quoted, has not been verified, L. B.). The epiglottis is flattened out and reclines upon the base of the tongue (this is, however, a question of shape of the valve and its ligamentous attachment, rather than of muscular impairment, L. B.). There is invariably loss of sensation. As a further sign, it may be mentioned that the voice is improved or restored by pressing the cricoid upwards under the thyroid cartilage.

6. **Paralysis of the arytenoideus and of the thyro-arytenoideus internus** (Figs. 127, 128, and 129, PLATE XIV.).—These muscles by their superficial situation are exposed to injury as a result of diphtheria, and in consequence of prolonged catarrhal inflammation of the overlying mucous membrane. Under such circumstances they may suffer together or separately. Paralysis of the arytenoideus has been noted also in hysteria and incipient phthisis. It results in malapproximation of the arytenoid cartilages during phonation. The cords are seen, by the laryngoscope, to be in apposition from before backwards as far as the vocal processes, while behind this point is a triangular interval. The voice is hoarse or completely lost, and the escape of breath renders talking fatiguing. The thyro-arytenoideus internus is normally an adductor acting conjointly with the thyro-arytenoidei externi and the crico-arytenoidei laterales. Separately it is regarded by Mackenzie and Lermoyez

as a detensor or laxor of the cord exercising a regulating function during its vibration. From this point of view it is not difficult to accept the statement that the muscle occasionally suffers from over use of the voice. The laryngoscopic appearance is highly characteristic. The edge of the affected cord is curved so as to present a concavity inwards, and the ellipsis so formed may terminate behind at the vocal process or continue to the whole glottis. In the latter case there is probably concomitant paresis of the other adductor (Ruault). The symptoms affect the voice only. It is weak and its range lessened. This may not appear with the speaking voice, as the higher notes especially are lost. If the weakness is very marked, however, the voice in speaking may approach a whisper.

In cases where the paralysis is attended by associated nervous disability, sensory or motor, these will have to be taken into account in forming a diagnosis. Mention need not further be made of the symptoms by which tabes, disseminated sclerosis, glosso-labio-laryngeal palsy, and other diseases may be distinguished. The localisation of a lesion presenting itself between the medulla and the periphery may be of importance. Those implicating the recurrent laryngeal alone have been sufficiently discussed. Injuries to the vagus, when situated between the places of origin of the recurrent and the superior laryngeal nerves, have the same laryngeal symptomatology, but in the case of the vagus there are added symptoms, derived from the lower air passages and intestinal tract. When the superior laryngeal is involved together with the recurrent, the symptoms are increased by alteration of sensibility and paralysis of the crico-thyroid. If the vago-accessory nerve be injured before its junction with the vagus, there will be complete recurrent paralysis and diminished sensation on that side, paralysis also of the crico-thyroid and of the corresponding half of the soft palate. The latter sign will also attend upon injury to the vagus above the point where its pharyngeal branch is given off. Finally, implication of the trunk of the spinal accessory above the point of separation of the vago-accessory will present, in addition, paralysis of the sterno-mastoid and trapezius muscles of the same side.

Treatment of Laryngeal Paralysis.

It will be seen from the nature and variety of the lesions which are the cause of paralysis, that to indicate the entire range of treatment would be to pass beyond the scope of this work. It will

appear also that many of these causes are irremovable, and that in a case of paralysis due to them, efforts can only be made with varying success to render life more tolerable and to guard against the danger of present suffocation. Such are aortic aneurysm and cancer. Others again tend to disappear or at least to diminish of their own accord, as, for instance, a cerebral hæmorrhage may undergo gradual absorption, or, as there is reason to suppose, function may return in spite of it. A very large number of the more serious lesions in question are a part of a more extensive disease, upon which treatment may affect a cure as in syphilis, or an arrest and temporary amelioration as in tabes, and perhaps progressive muscular atrophy and disseminated sclerosis. It would obviously be out of place here to detail all the measures that will commend themselves in these cases; they are in every disease the remedies suitable to the disease in question, and will be found described in appropriate text-books. Neither is it necessary here to consider the scope of the surgeon with reference to the removal of tumours and the relief of pressure. *We are properly concerned with local treatment only, and that directed immediately to the larynx*, more especially in connection with the paralyses in which this is likely to be effective. Speaking generally, local treatment affords a prospect of cure in proportion as the causating disease is near to the periphery, and in proportion to the absence or possibility of removing any obstacle to nerve function between the periphery and the nutritive centre in the medulla. A destructive lesion in the course of the nervous tract negatives all efforts to relieve paralysis, since it is a permanent bar to nutrition.

The cases in which direct treatment is most effective are then the myopathies which are the result of peripheral neuritis, and those others more chronic which are known to result from catarrhal inflammation in neurasthenic, anæmic, and weakly persons. As in every other instance, so with peripheral neuritis, once the disease is recognised the most urgent and imperative indication is to remove the cause; if the cause have been diphtheria or a chill, that is already out of reach; but if it be lead, alcohol, or any other toxic agent, measures must be taken not only to prevent its further admission, but to promote its elimination from the system. The maintenance of warmth is always required, rest will be enjoined, the more strictly in proportion to the acuteness of the condition, and various drugs will be employed under different circumstances. By far the most valuable and constantly useful of these, however, is strychnine. It should be given in the ordinary

dose to begin with, and the amount gradually increased. From one-third of a grain to a grain daily can thus be taken eventually. Other tonic remedies will be adopted to meet the requirements of particular cases.

Stimulation of the muscles and nerves by **electricity** is a resource of undoubted value. Not only is it possible in this way greatly to hasten the cure, but it may happen that this tonic element is of so much importance in the prognosis as to determine between permanent paralysis and ultimate recovery. The question as to whether faradic or galvanic currents should be used, must be decided by the circumstances of each case. In muscular degeneration from a typical peripheral neuritis such as that of diphtheria, the galvanic current will be the more commonly useful, since the chances are that the paralysis comes for treatment while still recent. Speaking generally, wherever there is reason to believe that the muscle-fibres are in a state of actual degeneration or repair, the galvanic current only will aid in promoting their nutrition; where it is the object to work up into compensatory vigour fibres remaining healthy in a mass of others which have grown obsolete from old disease, the faradic is the more energetic; and where, as often happens, both these purposes are to be combined, the two currents may be used, either separately or simultaneously through the same rheophores and electrodes. Whichever current be used, there remains the mode of application. Now there is no doubt that in every case where energetic stimulation is required, this should be made by means of an endo-laryngeal electrode. In this way only is there any certainty as to the path of the current, and the incidence of the volitional poles; hence on this account, and the great disparity of resistance between the mucous membrane and the skin, it is only with the endo-laryngeal method that one can be sure of administering at the point needed any considerable or effective dose of electricity. Further, it is much better to have two electrodes, one of large size, the indifferent electrode moistened and applied to the skin externally, the other in the larynx, than to employ a contrivance like Ziemssen's for application to the larynx at two points at once. It is best also that the indifferent electrode should be placed upon the nape of the neck, rather than over the larynx externally. Thus a larger extent of the nerve tract is submitted to the influence of the current. Moreover, by keeping the electrodes some distance apart, it is possible to maintain the polar distinction. This is a point of great importance. The properties of the two poles of a

galvanic current are very different. The positive pole alone can effect fibres which are in a state of degeneration. It will therefore be used in preference to the negative in all cases where mischief is supposed to be actually in process. The application should be made in every instance directly to the mucous surface covering the paretic muscles, and an attempt may also be made to reach the recurrent laryngeal nerve where it enters the larynx under cover of the cornu of the hyoid bone.

There are no cases more suitable than those in which the superficial muscles are paretic in consequence of, or in association with, catarrhal inflammation. Further, in cases of paralysis of the superior laryngeal nerve—as after diphtheria—and in others unimpaired by a defect of sensation, faradisation of the larynx, epiglottis, and soft palate gives good results. After a few sittings, surprisingly strong faradic currents with a metallic electrode can be borne without discomfort, and the patient's feelings are a safe guide in this respect. When the galvanic current is used, a galvanometer should always be included in the circuit. It is safer also to sheath the extremity of the electrode with cotton wool, which must be moistened with water before use. No rule can be laid down as to the strength of current,—about five milli-ampères will generally be thought enough,—but it is imperative that the operator should know what he is using, and be provided with the means of controlling sudden variations. Hence the necessity of a galvanometer. It will be borne in mind that the stimulating effect of galvanic currents is obtained only by making and breaking the current and by varying its strength, and also that current reversals offer an expedient for greatly increasing it.

In the case of functional aphonia, electricity may be made to subserve two purposes, having reference to the twofold causation. In so far as this is psychical, a moral effect is best produced by energetic faradisation; but when, as in anæmic and tubercular patients, there may be supposed also to be a defect of nutrition, galvanism may be added.

The prognosis in hysterical cases has one element of certainty, namely, that recovery will take place some time or another, and that as suddenly, and perhaps with as little reference to treatment, as was the onset of the attack. To bring about a sudden cry, as by the shock of faradisation, may forthwith set up the lost function, and speech will be from that moment restored, or every effort of this kind may fail. In the majority of cases,

electrical treatment will have to be supplemented by other, both local and general. Anæmia, constipation, mental or moral depravity, hygienic surroundings, will have to be attended to, and often the utmost care and skill will fail in producing an adequate result.

CHAPTER XXIX

DISEASES OF THE NASAL FOSSÆ

THE following may be taken as a good working classification of the various morbid conditions of the intra-nasal cavities; in the succeeding sections, to avoid reiteration, it is only approximately followed, and to some of the rarer diseases simple allusion may only be necessary. Those divisions printed in black type indicate the commoner groupings and the diseases of greatest clinical importance.

A. NASAL CAVITIES.

I. Morbid conditions of the **mucous membrane.**

- **Acute Rhinitis.**
  - *a.* **Simple,** or non-specific.
  - *b.* Specific—usually purulent—(in fevers, diphtheria, syphilis, gonorrhœa, glanders, etc.).
  - *c.* **Neurotic**—'hay-fever' or *periodic hyperæsthetic rhinitis*, and pseudo-hay-fever.
- **Chronic Rhinitis.**
  - *a.* Simple.
  - *b.* **Hypertrophic.**
    - **Simple**
      - Cavernous.
      - Mucoid.
      - Lymphoid.
      - Glandular.
    - Specific
      - Syphilis.
      - Tubercle.
      - Lupus.
      - Leprosy.
      - Glanders.
      - Rhinoscleroma.
  - *c.* **Atrophic.**
    - **Simple** {**Struma.**
    - Specific
      - Syphilis.
      - Tubercle.
      - Lupus.
      - Leprosy.
  - *d.* Rhinitis Caseosa.

- II. Morbid conditions of the osteo-cartilaginous framework.
  - Hæmatoma.
  - Abscess.
  - Perforations.
    - Specific.
      - Non-specific.
      - Fevers.
      - Syphilis.
      - Struma.
      - Lupus.
      - Lepra.
  - Narrowing. New formations.
  - **Deviations and Deformities.** *a.* Developmental, etc. *b.* Traumatic.
  - **Hypertrophies or Spurs.** *a.* Cartilaginous. *b.* Osteo-cartilaginous.
  - Necrosis and Caries.
  - Synechiæ and Synostoses.
- III. **New growths** (whether of mucous membrane, bone, or cartilage).
  - Benign.
    - **Polypi.** Myxoma. Myxo-fibroma.
    - Cystoma.
    - Papilloma.
    - Enchondroma.
    - Osteoma.
    - Exostosis.
  - **Malignant.** Sarcoma. Carcinoma.
- IV. **Epistaxis.**
- V. **Neuroses.**
  - Of Olfactory Nerve. Anosmia. Parosmia.
  - Of Fifth Nerve. Anæsthesia. Hyperæsthesia.
  - Of Facial Nerve. Paresis of Alæ.
- VI. **Foreign Bodies.**
  - Physical:—Rhinoliths, etc.
  - Biological:—Larvæ, etc.

- **B. ACCESSORY CAVITIES,** including
  - **Maxillary Sinus.**
  - Frontal ,,
  - Ethmoidal ,,
  - Sphenoidal ,,
    - Catarrhal.
    - **Suppurative.** Acute. Chronic.
    - Serous.
    - New Growths. Benign. Malignant.
- **C. NASO-PHARYNGEAL CAVITY.**
  - **Post-Nasal Catarrh.**—Bursitis.
  - **Hypertrophy of Pharyngeal Tonsil.—Adenoids.**
  - New Growths. Benign. Malignant.

A. DISEASES OF THE NASAL CAVITIES.

I. *MORBID CONDITIONS OF THE MUCOUS MEMBRANE.*

Acute Rhinitis.

Acute rhinitis may be of (*a*) a *simple*, non-specific nature; (*b*) of a *specific* variety, as when forming part of a contagious fever or in association with a special dyscrasia; (*c*) of a *neurotic* or hyperæsthetic character, as in the conditions known as hay-fever and pseudo-hay-fever. In each, the inflammation is, as a rule,

confined to the nasal cavities in which it first appears, but it may, especially in its specific varieties, arise secondarily from the pharynx, whilst in its simple form it may extend to the pharynx, middle ear, or larynx; or, on the other hand, to maxillary, frontal, ethmoidal, or sphenoidal cavities. This is especially true of recurrent attacks of acute rhinitis, in which the acuteness becomes, so to speak, almost chronic.

(*a*) **Simple Rhinitis** may be acute or subacute. The former will be first considered.

ETIOLOGY.—Acute nasal catarrh is popularly, and in all probability correctly, associated with exposure to cold and sudden changes of temperature, the attack being often aggravated by the inhalation of irritating matters, such as dust and chemical vapours. Exceptionally excessive heat causes acute catarrh in a neurotic subject. Amongst predisposing circumstances, youth; the strumous, rheumatic, and neurotic diatheses; and the influence of certain drugs, must be mentioned. Epidemics of acute nasal catarrh can generally be explained by the assumption that all those attacked have been exposed to similar conditions of season and environment, especially the insanitary.

PATHOLOGY.—Little remains to be added on this head to what has been said in the chapter on the general etiology of nasal diseases; and it may be laid down that vasomotor dilation of the vessels leading to engorgement of the erectile cavernous tissue, to increased activity of the serous and mucous glands, and of escape of leucocytes, constitutes the form to be recognised as *simple*; this is accompanied by only slight general disturbance.

Our knowledge of the etiology of nasal diseases generally, enables us to assert that a specifically infectious catarrh could hardly arise were the protective duties of the nasal mucous membrane effective. Certainly nasal obstruction is a marked characteristic of those suffering from frequent 'colds in the head'; and probably the constitutional disturbance accompanying the more serious forms of rhinitis is dependent, in at least some degree, on the nature and virulence of the responsible organism.

Fig. CCCXLVI., taken from a typical case of acute nasal catarrh, well represents the nature of the discharge. It will be seen that the leucocytes present considerable variations in size and nuclear mitosis. These are not to be considered as pus cells; they are simply migrated corpuscles from a non-ulcerated surface. The following bacteria were the chief of those found in this specimen:—

Diplococcus	Numerous.
Bacillus coli	,,
,, ulna	Few.
Staphylococcus aureus . . .	,,

These are representative of the condition under consideration, but there are others of less constancy in occurrence and numbers.

Coincident with subsidence of the attack, the various bacteria gradually diminish, with the exception of the staphylococcus aureus, which is so persistent as to represent in the later stages an almost pure culture. It is probably to this fact that the yellow colour of the mucus is sometimes due; it also affords an explanation of the generally mistaken idea as to the *constancy* of a purulent character in the nasal discharge of an ordinary acute rhinitis.

FIG. CCCXLVI.—SECRETION IN ACUTE ENDO-RHINITIS ($\frac{1}{12}$ *in. oil immn.*).

1. Multinucleated leucocytes; 2. Diplococci; 3. Bacillus coli; 4. Bacillus ulna.

Recent investigations into the changes in the leucocytes or lymphocytes indicate a considerable variation in size and character, particularly with respect to their reaction with basic acid and neutral dyes. The nucleus in some appears single, in others multiple, with great variety in shape. The exact relationship of these various conditions with the types and periods of rhinitis, has, however, yet to be established.

SYMPTOMS vary greatly according to the individual, and to the exciting cause. The first onset is often characterised by arrest of secretion, irritation of the nostril, and sneezing; these symptoms, indicating hyperæmia, are quickly followed by a hypersecretion. Instead of mere sneezing, there may be fever, succeeded by a feeling of chilliness, and rarely, the first symptom may be a well-marked rigor. Headache and fulness, sometimes amounting to severe pain in the frontal region, quickly follow, with, not infrequently, heavy and even painful sensations in the muscles and joints of the body generally. As the swelling of the rhinal mucous membrane, with its consequent uncomfortable obstruction to nasal respiration, increases, anosmia and aprosexia supervene. Then occurs a dry, and frequently sore, condition of the throat, due to enforced mouth-breathing. The paretic palate

influences the articulation, giving the characteristic muffled and toneless voice, which is usually altered also in phonetic quality by subacute changes in the larynx.

Lachrymation and deafness, the result of concomitant catarrh of the nasal duct, conjunctiva, and Eustachian tube respectively, with eczema narium, and redness of the tip of the nose and upper lip from the irritating discharges, are frequent. Illustrative of a coincidental troph-neurotic condition, we may often observe a crop of alar or labial herpes.

On dilation and illumination of the vestibule by **anterior rhinoscopy,** the mucous membrane is seen to be red and swollen; the redness, however, is not invariably present. The tumefaction of the 'baggy' inferior turbinated body can, in simple cases, be readily reduced by pressure, by application of a weak solution of cocaine, the sniffing of spirits of camphor or menthol; in this way erection due to acute catarrh can be differentiated from that of an old-standing hypertrophic rhinitis, which it may moreover complicate. The middle turbinated body will be seen touching the swollen septal mucous membrane, and this obliteration of the 'olfactory slit' so often observed is partly responsible for the anosmia. On **posterior rhinoscopic** examination, when feasible, flakes and plugs of mucus can often be made out in the neighbourhood of the Eustachian orifices, in Rosenmuller's fossa, in Luschka's pouch, and in the choanæ. The posterior extremities of the turbinated bodies, especially of the inferior, will be evidently swollen, and will appear of a deep red colour, unless obscured by mucus. In young persons the pharyngeal tonsil will be red and swollen.

PROGNOSIS is, as a rule, favourable. Extension to the accessory cavities of a non-specific nasal catarrh has generally been considered as rare, but recent statistics, to be detailed in Chapter XXX., show that it is frequent; happily it is for the most part only temporary; but when due to insanitary influences, or associated with acute infectious diseases—amongst which epidemic influenza must not be forgotten—recovery may be long delayed, chronic catarrh may be engendered, and with it a tedious train of symptoms in the way of hypertrophies and neoplasms, atrophy, and ozæna in the nasal fossæ, and a chronic empyema of the sinuses.

TREATMENT need not occupy much space, because, although each year scores of new remedies are suggested, there are but few that hold their reputation; and this for two reasons—first, that they are given *empirically*, and without the least regard to correction of the *predisposing* factor, or recognition of the *exciting* cause

of an attack; and secondly, because, as a rule, they are commenced too late. The physician being seldom consulted at the time of an acute coryza, directions for treatment must therefore be largely prophylactic; and prescriptions for remedies, being often given in advance of recurrence, must necessarily be of a tentative character. The following is an epitome of my general advice in such cases:—

1. **Prophylactic.** — Exercise, Turkish baths, avoidance of draughts on the one hand, and of over-clothing on the other; with especial precaution against retention of such extra garments as cloaks and wrappers within doors, all suggest themselves. A light diet, especially at night, and a regular daily action of the bowels, are both measures to be regarded as of importance by the catarrhally disposed subject. Not of least importance is the correction of any cause of nasal obstruction.

2. **Medical: Local.**—For the relief of the premonitory irritation or fulness, anti-catarrhal smelling-salts (Form. 97), the use of chloride of ammonium inhaler (p. 148), with or without addition of oxygenating ingredients (Form. 39), and the use of an oro-nasal inhaler with the inhalants in Forms. 39, 48, and 49, are all and each of service; but I have for some time now used nothing but menthol, inhaled by the nares or applied by snuff, insufflation, spray, brush, or, inhaler, or where the inspiratory power of the nostrils is for the time actually abrogated, by light tampons of menthol-wool.

It may be convenient here to make some remarks in detail on the properties of **Menthol**, to which I have so frequently alluded in other sections of this work.

This remarkable drug, which is of the nature of a camphor, exerts its action in the following manner:—

1. It stimulates to contraction the capillary blood vessels of the passages of the nose and throat, always dilated in the early stages of head-cold and influenza.
2. It arrests sneezing and rhinal flow.
3. It relieves, and indeed dissipates, pain and fulness of the head by its pain-killing and astringent properties, so well known by its actions when applied externally to the brow in cases of *tic douloureux*.
4. It is powerfully germicide and antiseptic. It thus kills the microbe of infection in many specific fevers, even when unaccompanied by fever. It also prevents its dissemination.

The remedy may be employed by means of a general impregnation of its vapour through a room or house, or locally to the nostrils and air-passages; for both which purposes there are several methods:—

(*a*) A 2 to 3 per cent. solution of menthol in almond oil, in liquid vaseline, or in one of the many other odourless paraffin compounds, can be sprayed into the nose or throat, or about a room.

(*b*) By mixture with spermaceti or sugar of milk in the proportion of ½ per cent., as a snuff.

(*c*) By placing ten to twenty grains in an apparatus specially designed by Rosenberg

for administering the drug in cases of laryngeal consumption by inhalation, in the form of vapour mingled with steam.

(*d*) By placing a similar amount or one or two drachms of the oily solution in a Lee's steam-draft inhaler, or bronchitis kettle.

(*e*) By a simple arrangement of placing a saucer of water containing a similar quantity of the crystals over a gas-burner in the hall, by means of which the whole house is kept constantly permeated with the drug during prevalence of an epidemic.

(*f*) But by far the most convenient method for personal use is to carry always the ingenious pocket menthol-inhaler known as Cushman's, which should be used not only then but on the first approach of an attack of rhinitis, and several times a day, in cold-catching weather, by those subject to head-colds.

The instrument consists of a glass cylinder, four inches in length, half an inch in diameter, and open at both ends. The tube contains crystals of menthol closely packed, and prevented from escape by perforated zinc and cork. The opening at one end is twice the size of the other, the larger being intended for inhalation by the mouth, the smaller for the nostril. The latter is the method which I by preference recommend. It is not to be simply smelt, but well sniffed or inhaled, so as to cause some tingling or smartness, a sensation which is quickly followed by that of coolness, and openness of the previously 'stuffed' and heated nostril.

I may add that for all forms of nasal disease causing obstruction to the natural breath-way, I have for very many years past largely prescribed menthol by means of direct application with atomiser or by inhaler. By its use, when the nasal discharge is excessive, it is checked; when deficient and thickened, as in hypertrophic rhinitis, its healthy character is restored; and when arrested, inspissated, and malodorous, as in atrophic rhinitis, fluidity is promoted, and the foul smell corrected. In cases of acute rhinitis, catarrhal or hyperæsthetic, in which the nostrils are so blocked that nasal inhalation is impossible, relief, unattainable otherwise, is afforded by insertion of a lightly carded fragment of wool, medicated to the extent of 5 per cent. with menthol. The same method is serviceable in cases of atrophic rhinitis, in which it is desirable to modify the over-patency of the nostrils, and at the same time to stimulate to healthy secretion. Menthol, by means of wool more powerfully impregnated to, say, 10 or 20 per cent., can be usefully administered through an oro-nasal inhaler.

I note that Lermoyez recommends that the menthol is to be dissolved in alcohol, but this form has the objection that all alcoholic preparations are very painful to the nasal membrane.

Cocaine locally is not a remedy to be advised for general and habitual use, and should be prescribed only rarely by the surgeon for relief of an exceptionally acute stenosis, or before operation.

General.—*First Stage.*—It is possible in many instances to cut short an attack at the initial of an acute stage, and to avert the *second* by taking the mixture in Form. 89. The opium, which is thus administered only in its stimulating dose, contracts the capillaries; and the belladonna, while it appears to diminish the constipating effect of the opium, assists by its specific action of inhibiting glandular secretions. Others recommend quinine in doses of 5 to 10 grains, but it is a remedy never prescribed by myself unless preceded by a smart purge. Dover's powder, taken at night, should symptoms have appeared in the evening, is also valuable with or without grey powder; but my personal

experience is that the first signs of an acute rhinitis are generally observed on rising in the morning, although they are doubtless aggravated as night approaches.

Even after the *second stage* of coryza has been reached, the opium and belladonna mixture may arrest it; but if not, I do not advise further perseverance with drugs. Camphor internally has been very disappointing in my experience; although a concentrated spirituous solution sniffed through the nostrils is said to be effective, it is certainly painful; and as to the local treatment by snuffs of tragacanth, or bismuth, with morphia, I have never seen the least benefit from their use (see p. 166). Ointments of eucaine or atropine, with vaseline, are more or less effectual in the earlier stages, and also on cessation of the clear hyper-secretion, but useless during the period of excessive rhinal flow. Menthol in ointment, or as a spray of an oily solution, is preferable. All these remedies act by causing a diminution in the capillary engorgement, and as a consequence in the amount of serous exosmosis. In a few instances Turkish baths are of service in the early stage. Sometimes, however, they only increase the symptoms and prolong the attack. The explanation of this untoward effect is that the heat excites capillary distension, while the transudation by the skin, and the reaction after shampooing and douching, are insufficient to restore the normal balance between the general vasomotor control and the functions of the nasal passages.

Specific forms of acute coryza in relation to *gonorrhœa* require special measures which come mainly within the range of general surgery. It must not be forgotten that acute coryza in infants is often an indication of a *syphilitic* dyscrasia; and this especially when the discharge is **purulent**, as it is far more frequently with them than in the case of adults. *Insanitary surroundings* are also to be noted as not uncommonly producing rhinitis of a purulent form in adults and also in children, especially those who are the subjects of lymphoid hypertrophies. The etiology of the neurotic disease, *hay-fever*, or what has been well termed by Sajous, *periodic hyperæsthetic rhinitis*, has been already discussed. Further consideration in relation to symptoms and treatment will be presently afforded.

The **treatment** of acute rhinitis complicating the *specific fevers* —especially *variola*, *scarlatina*, *measles*, and *diphtheria*—is essentially the same as that of the more acute forms of the simple variety, but germicidal sprays or douches are more clearly indicated, and the same may be said of nasal manifestations in

epidemic influenza, such as has been generally manifested during recent years throughout Europe.

In *children*, and especially in *infants*, blocking of the nostrils by purulent discharge leads to distressful and even dangerous symptoms. It is far more often associated with adenoid growths in the naso-pharynx than is generally recognised; and in the newly born, especially if associated with conjunctivitis, is often due to infection by vaginal discharges. For its relief, beyond treatment of the exciting cause, it is necessary to syringe the nares two or three times daily with a solution of borax or of Dobell's solution, or of a compound mixture similar to that in Form. 80.

Fibrinous Rhinitis.

Recognising that there is such a disease as diphtherial rhinitis, (*vide* p. 510, Chapter XXI.), we have to consider that there is also a form of nasal inflammation characterised by exudation of membrane, which, although probably bacterial in its nature, holds a subsidiary position in pathology, analogous to that of non-bacillary membranous laryngitis.

The membrane is usually found in the nares alone, having little or no tendency to extend to the fauces, pharynx, and larynx. Should this occur, a graver form of specificity may be presumed. This membrane may be removed without exposing a bleeding surface. It has none of the characteristic odour of nasal diphtheria, and although there may be some rise in temperature at the onset of an attack, and the symptoms may be those of acute rhinitis, with resulting nasal obstruction of considerable degree, life is never in danger, even though the vital energies may be severely depressed. But constitutional disturbance is usually absent, while anosmia and paralyses as sequelæ are conspicuous by their absence.

Risk of contagion is remote. Cultivation and inoculation experiments give negative results. The neighbouring glands are not involved, and no one has found the Klebs-Löffler bacillus.

There is a certain tendency to recurrence of the deposit; this may possibly be due to continuance of insanitary surroundings, which should be accepted as constituting an etiological factor of importance.

It must not be forgotten, however, that this condition may be simulated by the use of strong escharotics, especially those of the galvano-cautery and nitrate of silver.

Prognosis varies. Occasionally recovery is prompt under

suitable remedies, but in the ill-nourished it may be somewhat tedious, mainly because of the difficulty of either maintaining the recuperative powers or of enforcing the necessary means of cleanliness.

TREATMENT. — Local measures resolve themselves into detaching the membrane by a weak alkaline solution, such as Dobell's, or one of boric acid, in the form of a coarse spray, followed by gentle removal of the membrane by means of the forceps, and finally by the application of chinosol, menthol, or weak lactic acid by means of an atomiser.

John Sendziak recommends nasal insufflation of pure aristol, followed by application of light tampons charged with balsam of Peru and resorcin.

The nostrils may be provided with a respirator of a lightly-carded pledget of menthol wool (5 to 10 per cent.), or the introduction of a hollow nasal bougie lightly wrapped in wool impregnated with any of the foregoing antiseptics, or a mild sublimate wool may be used. Salicylate of quinine and of iron are the best internal remedies; but any or all of these may prove futile unless a change of *habitat* be insisted on.

SUBACUTE RHINITIS.

This is comparatively rare, and, when present, more often calls for surgical than for medical treatment. The condition is of importance on account of its disposition, if not cured, to proceed to the formation of hypertrophies; these are exhibited in children in the shape of post-nasal adenoid vegetations, and in adults as congestions and thickenings of the covering of the turbinated bones, especially the inferior and the middle, and of polypi.

Each of these subjects will occupy later consideration.

Rhinorrhœa is the form in which subacute rhinitis is generally manifested. It is not necessarily the result of an uncured acute 'cold,' or of a repetition of acute attacks, though there is usually a history of catarrhal predisposition. Cases are recorded in which many ounces and even pints of clear watery fluid have been discharged in the twenty-four hours for periods of many months — in one instance, of nearly two years. The amount of fluid collected in a given time has more than once been estimated. In one recorded instance, the flow was at the rate of one ounce and a half per hour. I have never had an experience of so severe a form, but have seen several patients who suffered from

a similar condition of only less serious grade. There is seldom any local sign beyond congestion of the membrane and soreness of the external nostril; but occasionally there is a polypus or other objective cause for the flow.

Chemical analyses of the secretion all agree *qualitatively*, although not always *quantitatively*; the solids, which are mucin, serum globulin, and serum albumin, represent the organic elements; whilst sodium chloride and calcium phosphate constitute the inorganic. The relative proportions of the organic to the inorganic are generally accepted as about 1 to 8.

The following are notes of two cases that occur to me:—

CASE CLXXIII. was that of a lady, æt. 38, who suffered from excessive nasal discharge, which had lasted some years, and greatly prostrated her. I could discover no cause for the condition, but she derived great benefit, and was ultimately cured, by use of the opium and belladonna mixture, with Turkish baths, and later a course of Donovan's solution with strychnia, and a sojourn at Harrogate.

CASE CLXXIV.—Mrs. T., æt. 45, was sent me by Dr. Bastable, April 11, 1887, on account of irritation and smarting of the nostrils, with frequent sneezing and incessant running of clear fluid, which had existed since last September. The sense of smell had become diminished, and respiration through the left nostril was impossible. She suffered from constant hemicrania.

She stated that she had always been susceptible to cold. Her skin transpired freely, but the slightest draught of air would check the perspiration, and then she would sneeze and have an attack, sometimes of cold in the head, sometimes of bronchitis. She had been always sensitive to offensive smells, and had been rather subject to small, painful gatherings inside the nose. All these conditions had, however, somewhat improved in the last few years. She dated her present condition from a night which she passed in Cologne the previous September, on her arrival from Wiesbaden. It had been a very hot day (97° F. in the shade), and she had arrived much fatigued. She was subjected to such offensive smells in the hotel that vomiting and diarrhœa supervened, and she was ill for some days. Since that time her nasal symptoms, as above detailed, had steadily increased. Life was described as simply intolerable.

On examination I found subacute inflammation of both nostrils, without other perceptible cause for her symptoms. Under treatment she was entirely restored to health.

TREATMENT of these cases is similar to that employed in the last case. Having anæsthetised the nares with cocaine, I freely apply galvano-cautery to both nostrils, and prescribe stimulating sprays and ointments. Where the galvano-cautery fails, the constant current of 6 to 10 cells may be effective.

NEUROTIC OR HYPERÆSTHETIC RHINITIS, INCLUDING HAY-FEVER AND PSEUDO-HAY-FEVER.

Sajous appropriately states that 'periodic hyperæsthetic rhinitis may be defined as an affection characterised by periodical attacks of acute rhinitis, complicated sometimes with asthma,

occurring as a result of a special susceptibility on the part of certain individuals to become influenced by certain substances, owing to a deranged state of the nerve centres. It manifests itself only provided the mucous membrane primarily affected in the course of an attack is in a state of hyperæsthesia, and when the irritating substances are present in the atmosphere.'

This condition, otherwise called *summer catarrh*, *rose-cold*, etc., requires for its development three factors:—

1. A predisposing neurotic idiosyncrasy with debility of vaso-motor control.

2. A resulting chronic hyperæmia of the vascular tissues and hyperæsthesia of the nerve endings of the nasal passages.

3. An exciting agent, which varies with the individual and the locality. It may be the pollen of a grass, of a rose, or of other flower; or it may be certain noxious conditions of the atmosphere which are peculiar to certain seasons of the year and certain localities, and independent of any vegetable particles.

Periodic hyperæsthetic rhinitis, due to pollen, and occurring during the summer, constitutes *true hay-fever*; that associated with any other exciting agent is better distinguished by the title of *pseudo-hay-fever*.

Great credit is due to Blackley of Manchester for demonstrating in 1873 the correctness of Elliotson's views, put forth in 1839, that true hay-fever is associated with the presence of pollen in the inspired air. In 1876, Beard of New York demonstrated the fact that there were *numerous other* exciting agents besides pollen, and he called attention to the marked neurotic element in hyperæsthetic rhinitis. Amongst other biological exciting agents it is necessary to say a few words concerning the presence of 'infusoria' in the nasal passages; Helmholtz, in 1869, himself a sufferer from periodic hyperæsthetic rhinitis, suggested that the disease was due to the presence of vibrios in the nasal passages, which exhibited periodical activity during the hay season. Present knowledge permits the suggestion that under the term 'vibrios,' Helmholtz really referred to certain flagellate bacteria which are sometimes found in active movement in the nasal secretions of sufferers from hyperæsthetic rhinitis. On the few occasions in which I have looked for these organisms in hay-fever and pseudo-hay-fever patients, I have not succeeded in finding them; and their existence is by no means easy of demonstration. The organisms are apparently the same as those described by Salisbury as present in an American epidemic of influenza. Elsberg confirmed the observation, and found similar

germs in the secretions of those suffering from acute forms of hyperæsthetic rhinitis.

It is not probable that the microbe thus described in connection with ordinary influenza, or with hay-fever, would be frequently present in those suffering from the epidemic attacks of what is now termed *la grippe* or Russian influenza, a disease which gravely affects the nervous as well as the respiratory system. The specific microbe of this malady, so far as present investigation shows, has been claimed by some to be nearly identical with the bacillus or rather diplococous of pneumonia; by others the microbe is held to be of the nature of a 'flagellate monad.' At the present day the organism most in favour is that of Pfeiffer, which is also a diplococcus; its specificity has been established.

Sensitive Areas.—Reference has already been made in the chapter on Etiology to 'sensitive areas' on the inner surface of the inferior turbinated body, as demonstrated by John Mackenzie and Häck. It must now be conceded that it is much too narrow a view to regard this region as the only sensitive one. Sajous has described three other hyperæsthetic areas, one situated on the outer wall of the nasal fossæ in front of the middle turbinal, and two on the mucous membrane of that body,—the first of which is near its anterior, and the second near its posterior extremity. My own experience would point to the fact that on the septum, and especially over spurs and projections caused by deflections, there are acutely sensitive areas, and that the situations thereof vary greatly in different cases. Some authors hold that there are separate sensitive areas corresponding to the acts of lachrymation and sneezing, and in addition to an 'asthma zone' and a 'cough zone.' It is, however, contrary to my experience to believe that asthma is specially connected with hyperæsthesia or morbid lesions in the neighbourhood of the terminations of the nerve of Cotunnius,—the naso-palatine branch of Meckel's ganglion. Sneezing and coughing are often intimately associated with an exalted hyperæsthetic area. Sneezing is likewise often exhibited as symptomatic of the irritation caused by a septal spur in contact with the middle turbinal. Similarly contact of the spur with the inferior turbinal may explain some cases of otherwise unaccountable paroxysmal cough. I have frequently had such cases under observation.

Too much trouble and patience cannot be taken to ascertain the existence of hyperæsthetic regions by means of the probe, since they are often the cause of otherwise unexplained cases of *paroxysmal cough*, *vertigo*, and other reflex symptoms, the

successful treatment of which can only be attained by accurate cauterisation of the hyper-sensitive sites.

Cases of hyperæsthetic rhinitis occurring in the winter as well as the summer, and to which the term 'pseudo-hay-fever' has been applied, are not uncommon in private practice, but comparatively rare with hospital patients. Such sufferers are occasionally engaged in some dusty form of employment, though not invariably so. I have seen several examples which have appeared to be directly consequent on attacks of epidemic influenza.

The following case of hyperæsthetic rhinitis, in which the presence of pollen proved a potent excitant in the summer, and dust a less powerful, though no less obvious, irritating agent at other seasons of the year, is recorded as a type of this class of case. The history is condensed from the patient's graphically written statement.

CASE CLXXV.—W. H. H., captain R.N., æt. 43, came under my care in May 1888, stating that he had suffered from hay-fever since two years of age, certainly as long as he can remember; entered the navy in June 1859; suffered only slightly during a summer spent in Nova Scotia, although he assisted to 'make hay' more than once; whilst serving in Channel Squadron, from 1864 to 1866, noticed that the 'hay-fever was modified by residence on board and avoidance of the shore.' When stationed at Portsmouth he later observed that he suffered severely on shore. The symptoms disappeared, however, twenty-four hours after leaving in a troopship for the Mediterranean; but on reaching the Gut of Gibraltar, where a strong east wind was blowing off land, he had a severe relapse. During a voyage round the world, in 1869 and 1870, though never quite free from catarrh, had no very inconvenient symptoms; even in the tropics, however, the nasal mucous membrane was *always* hyperæsthetic, and especially so during the months of June and July. Whenever he spent a summer in England he got asthma and had to go to the seaside. During service on the Australian station he always had hay-fever symptoms in Melbourne (a very dusty town in those days), but suffered scarcely at all in Tasmania. The attacks in the southern hemisphere were of a different and milder character to those experienced in England and France, he never having asthma south of the line, but only (modified) coryza. 'An ordinary attack begins with violent sneezing fits, great irritation and secretion from the eyes, very copious discharges from the nares, and irritation of the palate; as the inflammation extends to the throat, asthma and a most distressing cough supervene, the last remaining after the other symptoms have disappeared.'

On examination, this patient had well-marked evidences of hyperæmia and hypertrophy of the inferior and middle turbinated bodies, but without any marked septal deviation or outgrowth. Application of the probe about half-way back in the inferior meatus produced violent sneezing and distress. The soft palate was paretic, and the uvula thickened and relaxed, and there also existed varix of the vessels of the base of the tongue, and hypertrophy of the lingual tonsil. Only the slightest evidences of pulmonary emphysema were to be detected, but the patient stated that when under the influence of an acute attack, his chest trouble was considerably aggravated. Galvano-caustic treatment to the various implicated regions, with internal administration of phosphide of zinc, arsenic, and nux vomica, ultimately resulted in a successful issue, the patient writing in December 1888: 'I am, and have been, very well. I was in Wales from August 2 to September 6, during the whole time hay was making, and I certainly suffered less than I have ever done before in England.'

For the correct interpretation of the various symptoms, and a proper comprehension of the indications for scientific treatment, it cannot be too strongly urged that the predisposing factors are of overwhelmingly greater importance than the exciting. This is so, whether the local condition be that of the acute coryza and temporary nasal stenosis of hay-fever, or of asthma and other respiratory symptoms sometimes associated with them, and sometimes separately manifested. The nature of the predisponents has been indicated in the etiology. It remains to briefly enumerate the chief symptoms of the malady, and to indicate the lines for rational therapy.

The SYMPTOMS are, in the first instance, those of *acute catarrh*; but they occur more suddenly, and are manifested much more severely; the sneezing, coryza, nasal stenosis, headache, and debility all being more acutely distressing than is observed in non-specific rhinitis. Added to these manifestations, there is excessive lachrymation, with conjunctivitis and effusion into the eyelids. Patients frequently complain of sore throat and of great irritation, sometimes of the nature of an incontrollable itching of the palate. Where the veins are engorged there is *pharyngeal tenesmus*, a condition in which all the symptoms of a rectal or vesical tenesmus are accurately simulated. Pyrexia is of varying degree, and as a rule is less than in an ordinary acute cold in the head.

Beyond these catarrhal symptoms, and sometimes independent of them, or at least of far more distressing importance, occurs an asthma of acute and quite temporary character. This symptom differs from the same respiratory malady uncomplicated by the direct irritation of season, in that it is manifested in the day quite as frequently and as intensely as at night. It passes away without leaving any impress on the lung tissue, and does not recur until the return of the season favourable to an attack.

The TREATMENT of hay-fever until recently has been not only most irrational, but (if one may use such a term) cowardly. Instead of attacking the predisposing idiosyncrasy, or the local hyperæmia, the former has been accepted as inevitable, and the latter ignored; while as to the exciting irritant agent, it has been simply shut out. Confinement to the house, change of residence, plugging the nostrils with tampons of wool, and wearing of goggles and double-gauze veils, are measures of but little value in arresting an attack, and are in no sense preventive of a recurrence. Nor are snuffs, whether containing morphia (as do those known as Ferrier's), or of boracic or salicylic acid, or with either of these *plus* capsicum (!), any more useful than might be expected

in consideration of the unphysiological character of the indications advanced by their advocates. My views on these questions are the result of a lengthened experience. They were set forth more fully in a paper on the treatment of hay-fever, which was published in the *British Medical Journal*, June 21, 1884.

The neurotic state, once recognised, is to be attacked on general principles by nerve tonics, electricity, general douches, massage, and the like. And these lines may be pursued with advantage in the intervals of the seasons in which the attacks appear. As a nerve tonic I am in the habit of prescribing a triturate composed of $\frac{1}{10}$th grain of phosphide of zinc, and $\frac{1}{2}$th grain of extract of nux vomica (Form. 105); and I have also found service from another combination much lauded by Bosworth, namely, phosphide of zinc, arsenious acid, and belladonna. When there is pronounced anæmia, as is often the case, peptonised ferro-manganese with arsenic is serviceable. On occurrence of an attack, remedial measures are to be divided into (1) *palliative* and (2) *radical*.

Palliative internal measures may be represented by the opium and belladonna mixture, or by large doses of quinine, with or without hydrobromic acid, but always preceded by a purge.

Palliative local treatment includes the inunction of the nostrils and eyelids with ointments of vaseline with atropine. The use of the menthol inhaler, or of an oro-nasal inhaler, with the inhalant in Form. 41, or inhalations of the vapour of chloride of ammonium, in combination with various medicaments, such as ozonic ether, oil of eucalyptus, or pine in alcohol; menthol, camphor, chloroform, or aldehyde. Anti-catarrhal smelling salts (Form. 97), the action of which is quite different from that of snuffs, are often of great value in hay-fever. They probably act by stimulating the capillaries to contraction. The comparatively new remedy, cocaine, has more than answered expectations in giving relief to the symptoms of hay-fever, and since its physiological action is to contract the mucosal capillaries, especially those of the lower turbinated bodies, its success has confirmed the views previously expressed, that the main predisposing factor of local importance was a general or local area of excessive vascularity in some portion of the nostrils. Cocaine may be administered in ointment, as a spray, or by introduction into the nostrils of pledgets of wool soaked in a solution. The dangers of persistent cocainism already insisted are to be borne in mind and avoided. It may again be mentioned that eucaine appears to effect all that is locally beneficial in cocaine, with none of its harmful risks.

Radical local treatment consists in destruction of any hyperplasiæ or polypi in the nostrils, or in reduction of its vascular supply by the careful application to any hyperæmic area, of galvano-cautery or of some other caustic agent, of which may be named in their order of efficiency, chromic acid, fuming nitric acid, and glacial acetic acid. Preliminary to any of these applications, the membrane is to be anæsthetised by cocaine and then dried.

It is hardly necessary to mention that any other local cause of irritation, as a septal spur or deformity, a relaxed uvula, enlarged veins, or granulations at the back of the pharynx, should be looked for, and if present should be effectively removed, according to the lines laid down in the appropriate sections. Although I usually recommend the adoption of these slight operative procedures either before an acute onset or after its subsidence, I have occasionally pursued them at the request of a patient on supervention of an attack. I have never seen any harm result therefrom, but, on the contrary, have generally succeeded in arresting the progress of the existing discomfort.

CHRONIC HYPERTROPHIC RHINITIS.

It is somewhat difficult to state with exactitude the **relative frequency** of this condition in relation to other diseases in this region, because, however generally agreed colleagues may be, allowance must always be made for slight variations in individual estimate of the boundary line between the normal and the hypertrophic. **Hospital Statistics** for ten years give 8,608 cases diagnosed as hypertrophic rhinitis in a total of 16,675 cases, otherwise upwards of 50 per cent. of diseases of the nasal fossæ, with a relationship of 15 per cent. to all diseases of the nose, throat, and larynx.

The ETIOLOGY of simple hypertrophic rhinitis has been already considered at some length, and I am in agreement with John Mackenzie in believing that it is the result of the frequently recurring erections associated with repeated acute and subacute attacks of catarrh. Amongst other occasional concomitant factors in the induction of hypertrophy of the nasal mucous membrane, may be mentioned climatic conditions, the living or working in dust-laden or other deleterious atmospheres and insanitary surroundings, tobacco smoking, and various constitutional states, including the catarrhal, gouty, rheumatic, and scrofulous. The lesions may date from some specific fever. Bosworth recognises none of the above as factors

off the vestibule from the choanæ. In point of fact, however, this band is but an exaggerated *limen vestibuli*, for it often disappears on the introduction of the speculum.

Histo-Pathology.—Hypertrophic rhinitis is a comprehensive term, which embraces most forms of thickening of the nasal mucous membrane, varying in degree from a simple localised or diffused swelling to a cluster of polypi.

It will be expedient, for histological purposes, to classify the different varieties according to the predominant tissue or morbid changes, in their order of relative frequency, namely :—

1. Vascular.
2. Mucoid.
3. Lymphoid.
4. Glandular.

The **vascular** form may vary from a simple general distension of all the vascular elements, to the more serious and permanent enlargement of the cavernous spaces known as turbinal varix.

The first requires no special description, since there is an almost simple and uniform hypertrophy of the mucous membrane, with an increase in size and number of both arterioles and capillaries. The enlargement generally shrinks under the influence of cocaine, but relatively less than does the normal mucous membrane.

Turbinal varix, however, represents a more definite morbid state, due to a permanent distension of the *Schwellkörper* or erectile tissue, which is chiefly distributed on the posterior end and lower border of the inferior turbinal, slightly on the septum and middle turbinal (see p. 72).

The muscular walls of the cavernous sinuses undergo degeneration varying in degree from simple thinning to complete disappearance. This change is evidently due to the muscle elements being individually and collectively involved in a mucoid degeneration so common to this region. This infiltration of the boundary wall is inevitably attended by distension of the vascular space, since, the power of active contraction being removed, it gradually undergoes further passive enlargement, a process facilitated by the pneumatic or suction action of respiration which is coincident with blocked nostrils. Such a condition easily explains the absence of contraction under cocaine. These special conditions are always associated with more or less mucoid changes in the interstitial connective tissue.

Fig. CCCXLVII. illustrates the appearance of a section taken through that portion of the posterior end of an inferior turbinal which projected into the naso-pharynx. It shows considerable distension of the venous spaces, whilst Fig. CCCXLVIII. gives in detail degenerative changes in the visceral muscle fibres which constitute their boundaries. *En passant*, it may be remarked that, concurrently with this **turbinal varix,** we often find varix of the pharyngo-glossal region, and hypertrophy of the lingual tonsil, with other evidences of either hereditary or degenerative varix. And this condition accounts not only for excessive nasal secretion, but for some forms of epistaxis, and for those symptoms known as 'reflex,' many of which have been grouped by myself, when occurring in the pharynx and larynx, under the generic term of 'regional tenesmus.'

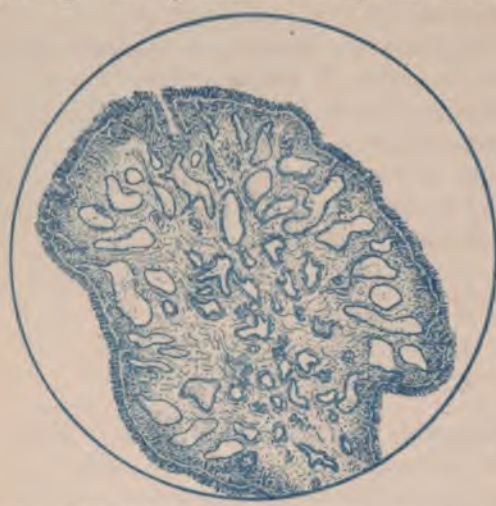


FIG. CCCXLVII. — CAVERNOUS HYPERTROPHY OF POSTERIOR END OF INFERIOR TURBINAL (1 *in. Obj.*).

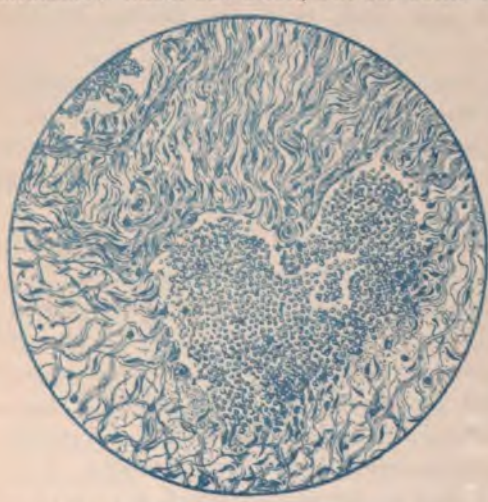


FIG. CCCXLVIII.—VASCULAR HYPERTROPHY OF INFERIOR TURBINAL ($\frac{1}{8}$ *in. Obj.*).

Mucoid hypertrophy consists chiefly of a uniform thickening of the mucous membrane due to œdematous changes occurring in the matrix. It is most marked at the anterior end of the middle turbinal.

As the term 'œdematous' may be misinterpreted, it is expedient to explain that in this instance it is used to express a swollen condition of the

interstitial or connective tissue of the parts, due, in the first case, to an increase in the mucin-holding matrix; and, secondly, to the absorption of water by the hygroscopic nature of the mucin itself. The changes are identical with those occurring in polypus formation, but instead of being localised are diffused. Figs. CCCL. (p. 784) and CCCLXXXVI. (p. 831), afford good illustrations of the finely reticular arrangement occurring in each condition.

Lymphoid hypertrophy (Fig. CCCXLIX.) consists of an enlargement due to the presence of small cell tissue in type identical with the diffused and irregular patches occurring in different parts of the nasal cavities. The condition may be simply indicative of a slow inflammatory process; or it may be part of a general lymphadenomatous or leukœmic state; or, again, it may represent but a localised hypertrophy of the normal lymphoid elements of the part, just as occurs in the case of enlarged tonsils or naso-pharyngeal adenoids. The process is most frequently found to involve the anterior half of the inferior turbinal, the middle turbinal, or the hinder region of the septum.

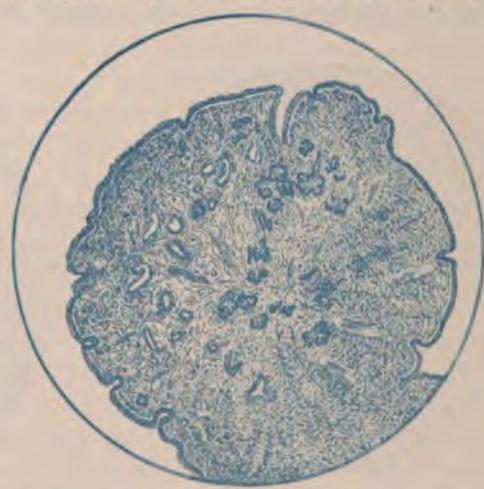


FIG. CCCXLIX.—LYMPHOID HYPERTROPHY OF LOWER TURBINAL (1 *in. Obj.*).

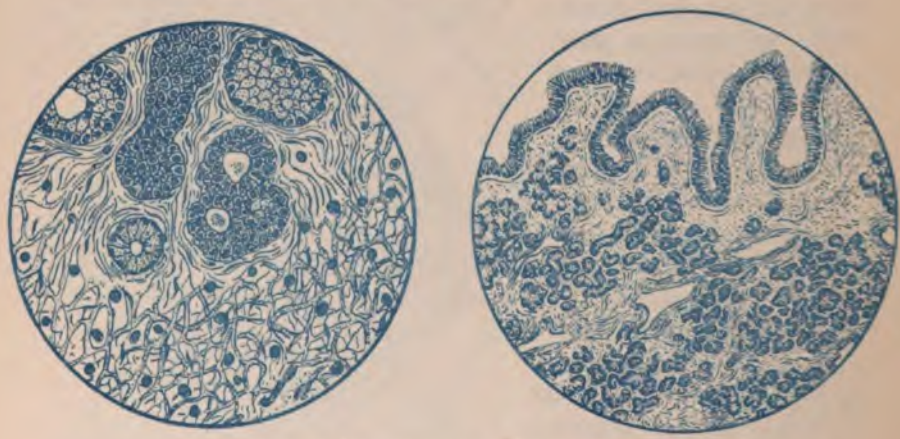
Glandular hypertrophy is well illustrated by Figs. CCCL. and CCCLI. Although mucoid and other changes may be coincidental, considerable increase in the size and number of the albuminous and mucous glands constitutes a morbid hypertrophy most commonly found to involve the anterior end of the inferior turbinal and the middle region of the septum. In the latter site it may represent an exaggerated 'tubercle,' and thus forming a soft or false spur,—an interpretation which is justified when the swelling is found on a level with the lower border of the middle turbinal.

The glandular forms would appear, according to our observations, to be the least frequent, and to be associated principally with the hyperæsthetic or periodic forms of rhinitis.

The SYMPTOMS of hypertrophic rhinitis—whatever the variety

—are those of nasal obstruction, as already enumerated. Clinically, I am in the habit of further subdividing them into those which are commonly and those which are only occasionally or exceptionally present.

Amongst the **common** characteristic evidences are a feeling of stuffiness and inability to breathe freely through the nostrils; this is accompanied by the dry throat in the morning on waking, and, in long-standing cases, the typical physiognomy of the mouth-breather; the voice is either muffled, toneless or hoarse, or it exhibits a so-called nasal twang. There is nearly always in fully established cases some morbid condition of the contiguous air-passages, of which Eustachian obstruction, chronic pharyngitis, both of the hypertrophic and atrophic form, pharyngeal and lingual



GLANDULAR HYPERTROPHY OF INFERIOR TURBINAL.

FIG. CCCL.—($\frac{1}{6}$ *in. Obj.*) FIG. CCCLI.—($\frac{1}{2}$ *in. Obj.*)

varix, elongated uvula, paretic velum, and chronic laryngitis are the most frequent. Of the non-constant or **occasional** symptoms, impairment of the functions of hearing and of smell, and of the appreciation of flavours, are among the most marked. Headache, lassitude, aprosexia, and epistaxis are more or less frequent, though not always referred to by the patient. Prominent reflex neurotic symptoms, in spite of the amount that has been written of them, are not of severe grade as results of ordinary hypertrophic rhinitis, although they are sufficiently common. Their connection with hyperæsthetic rhinitis has already been insisted on.

Much difference of opinion appears to exist as regards the **secretions**. Thus, whilst Sajous holds that they are increased, Bosworth teaches that they are diminished. It can with con-

fidence, however, be asserted that in hypertrophic catarrh the rhinal secretions are abnormal and modified. In many instances, but especially in the early stages, the fluids poured out are apparently increased in amount; later, the watery constituents are diminished, and hence the nasal passages become blocked with thick mucus, which the impaired ciliary action is incapable of speedily removing. When there is much anterior stenosis, normal nasal inspiration, involving the duty of saturating the inspired air with moisture, will be impaired, so that, although only the normal quantity of watery fluid is actually poured out, there is excess in the choanæ; later, as hyperplasia in the deeper layers of the thickened mucous membrane proceeds, transudation of the watery and serous fluid diminishes, whilst the mucous glands are, to say the least, apparently not less active than in health. This relative increase in the mucin and solid constituents of the secretion predisposes to accumulation in the accessory sinuses and choanæ, which together with collapse of the alæ explains the inability to satisfactorily blow and clear the nose, a symptom so often complained of; while the presence of mucous and muco-purulent accumulations at the back and sides of the pharynx gives rise to characteristic hawking and hemming. This condition, known as **post-nasal catarrh,** may or may not be associated with morbid catarrhal changes in the naso-pharyngeal cavity. As regards the character of the secretions in hypertrophy, they always contain leucocytes, and on account of the stagnation in the nasal cavities the mucus sometimes assumes a muco-purulent, a blood-stained, and more rarely a fœtid condition. Bosworth believes that fœtor of the breath in hypertrophic catarrh is always due to bad teeth, foul tongue, or some such extra-nasal cause; but in my experience, fœtor, usually quite distinct in character from that occurring in atrophic rhinitis, occasionally results, as is also more rarely the case in polypus, from retention of the secretions in the fossæ, and especially in the antrum and other accessory cavities. This fœtor is now generally recognised as due to the presence of a specific organism, the *bacillus fœtidus*.

Physical Examination.—On the outside, the nose often appears thickened, especially in the upper two-thirds; but this is frequently more apparent than real, on account of collapse of the alæ below, and this condition is usually much more marked in the case of polypi than of hypertrophic rhinitis. On raising the tip of the nose with the thumb, it is possible with a good reflected light to explore the vestibule. On dilating with a speculum the

often narrowed limen is widened, and the nasal passages come more or less into view, according to the degree and site of the hypertrophy. When excess of secretion obstructs the view, a nasal spray or douche followed by gentle use of the pocket-handkerchief will be necessary. It is of practical interest to remark that, where the secretion is thick and tenacious, the solutions to be employed should be alkaline, as they dissolve mucin (Form. 80). Where there is reason to suspect the presence of pus, a solution of sulphate of soda is indicated, this salt having special solvent power over the globulins (Form. 77).

The areas containing cavernous tissue are usually most and first affected. The thickening of the inferior turbinated body may be more marked at one or other extremity, or, as is usually the case, the whole of the body, including the underlying bone, is enlarged in its entire length, the prominence being most marked at its anterior end, where it not infrequently touches the septum, causing anterior stenosis. This swelling is usually red and globular, but may be moriform, and is quite unlike a polypus, from which, moreover, it can easily be further differentiated by determining its attachment with a probe. It only partly subsides under cocaine, but sufficiently to enable one to explore the middle turbinated body and meatus and the upper part of the septum. This feeble response to cocaine enables one to differentiate cavernous hypertrophy from ordinary catarrhal swellings. Hypertrophy of the middle turbinated body is usually most marked at its lower edge. It differs in appearance from thickening of the mucosa of the septum and inferior turbinal, in that it is whitish, gelatinous, and translucent like a polypus, and hence often termed polypoid.

A thickening of the septal mucosa, and the presence of osteo-cartilaginous spurs and deviations, can readily be made out by anterior rhinoscopy and probing. Spurs do not, of course, respond to cocaine so far as bulk is concerned, though the colour may be lessened by capillary contraction.

Posterior rhinoscopy usually reveals some swelling of the hinder extremities of the middle and inferior turbinals, and occasionally of the tubercle of the septum when existing. The hypertrophy, however, is almost invariably most prominent at the hinder extremity of the inferior turbinated body. These swellings are of two kinds, viz. the red and fleshy-looking, and the whitish, gelatinous, or polypoid. I think the latter are more frequent. They vary much in size, from that of a pea to that of a small walnut, and may entirely block the naso-pharynx. Most

cases come under notice when the growth is about the size of a hazel-nut, as they then begin to affect the hearing. The surface may be likened to that of a mulberry in form and sometimes in colour; but reddish and also translucent globular swellings are by no means rare.

PROGNOSIS.—The evil consequences of hypertrophic rhinitis are those of nasal obstruction, detailed in Chapter XII. The prognosis is usually good as to reduction of the stenosis; but as regards the frequently concomitant symptom of deafness, much will depend on the previous duration of the morbid conditions of the middle ear, and on the energy and perseverance in treatment.

TREATMENT.—Palliative medication, in the shape of douches, sprays, and medicated bougies, are of service in those conditions of subacute catarrhal erectile swelling which follow acute attacks, and represent initial stages of hypertrophy; but when hypertrophic overgrowth of the layers of the mucosa is fully established, it is mere waste of time to dally with such remedies; only surgical measures are likely to afford permanent relief to the obstruction. In the simpler cases of turbinated overgrowth, uncomplicated by septal deformities and mulberry-shaped excrescences, the reduction of tissue and relief of obstruction is best effected by some destructive cauterising agent. The cautery should, if scientifically employed, attain two ends, viz. (*a*) the reduction of the superficial layers of the mucosa by the formation of a slough, and (*b*) the shrinking of the underlying vascular tissues by the formation of inflammatory adhesions to the periosteum.

In my own practice I employ the galvano-cautery for this purpose. When there is a large hypertrophied inferior turbinated body, I am in the habit at the first sitting (after cocainising the nasal cavities) of plunging a long and slender cautery-point into the cavernous tissues in a direction close to, and as near as possible parallel with, the inferior border of the bone. In moderate cases one or two repetitions of this procedure suffice to secure the requisite reduction of the inferior turbinated swelling; but when the condition is very marked, little reducible under cocaine, and of long standing, it is necessary to make linear superficial cauterisations as well, especially along the inner and lower sides of the body. The anterior third of the inferior turbinal may be burnt at one sitting, the middle third a week later; and the operations, if more are necessary, repeated at similar intervals.

I rarely apply the electro-cautery to the posterior third of the

turbinals. Hypertrophies in this site are more easily, and, on account of the proximity of the Eustachian tube, much more safely reduced by means of a snare passed through the inferior meatus and adjusted to the excrescence by aid of a finger in the naso-pharynx. Large globular and also moriform enlargements of the anterior extremity of the inferior turbinated bodies are best removed by transfixion with a needle and then snared. In some cases the entire removal of the posterior overgrowth by the '*spoke-shave*' of my deceased colleague, Carmalt Jones, has yielded excellent results, though, as I have frequently had occasion to state, my views as to the procedure both as regards its adoption before the age of puberty and as to the amount necessary to remove, are much more restricted than have been those of the inventor and of some of my colleagues. It is important to note that the procedure is sometimes attended by rather brisk hæmorrhage, both immediate and secondary; nevertheless, with the lapse of years, we are constantly hearing from former

FIG. CCCLII.—CHROMIC ACID APPLICATOR (½ measurement).

patients at our hospital of the excellence and permanence of results.

Hypertrophies of the middle turbinated body are most safely snared, being held in position during adjusting of the loop by means of small hooks or fine forceps. If they are not satisfactorily reduced by these means, the galvano-cautery may be employed; but I would warn younger members of the profession that it must be used at the upper part of the nasal cavities with considerable caution.

Many specialists, including some of my own colleagues, prefer to use chromic acid instead of the galvano-cautery in cases of inferior and middle turbinated hypertrophy, and I have become in recent years a convert to its more extended use. It must be borne in mind, however, that acid cauteries, even if the healthy mucosa is protected by intra-nasal guards, require to be applied with care and discrimination.

My method of applying chromic acid is as follows:—First, a cotton-wool pledget soaked in a solution of cocaine hydrochlorate, about 15 per cent., or eucaine, 5 per cent., is introduced into the nostril to be cauterised, and in the direction of the tissues to be attacked, viz. along the inferior or middle meatus. Then the applicator, which consists of a piece of copper flattened at one end and turned as a screw at the other, and with a shoulder, as shown in Fig. CCCLII., is charged with chromic acid. This acid should

be kept in a state of deliquescence and in very small quantity in a stoppered bottle, so that on tilting the bottle the applicator takes up the acid on only one side. Then any excess of the acid at the edges, or on the opposite side of the copper rod, is to be wiped off, and the acid fused on to the applicator by holding it over a gas or spirit flame.

The screw end of the instrument is then armed with absorbent cotton, and by this time, the nostrils having probably become sufficiently anæsthetised, the cocaine pledget is removed, and the tissues dried by the wool-covered end of the applicator.

The foregoing precautions are necessary to prevent too great diffusion of the acid, as is the case if it is applied wet, or as an undeliquesced crystal, or unless the parts are previously deprived of any superfluous moisture. To actually apply the chromic acid, it is important to touch only the tissues to be cauterised, and in the case of the inferior turbinal body, to carry the instrument far back, and all round the body, and not, as is so often done, to make but one small patch.

Immediately on withdrawing the cauteriser, a coarse spray (Fig. CVII.) containing Dobell's solution is to be employed, in order to neutralise any excess of the acid, and to ensure against systemic poisoning, an accident which has more than once been reported. Lastly, when the nose has been 'mopped,' not 'blown' with the handkerchief, a mild spray of menthol may be used.

Tri-chloracetic acid represents another form of chemical cautery. It is very powerful, but has the disadvantage that it is very diffusive.

Thickening of the mucous membrane of the septum can be somewhat reduced by cauterisation, but this remedy is seldom required in this situation, and it is to be employed sparingly, seeing how slow wounds of the septum are to heal, and how liable they are to throw out adhesive bridges. On the other hand, the rectification by saws, trephines, and other surgical means of osseous and cartilaginous septal deformities and spurs, which are so frequently present and complicate obstructive hypertrophic rhinitis, is a measure to which I attach the very greatest importance. The treatment of these complications is fully given in a succeeding section. Solid bougies are not used so frequently by me as by some surgeons, except after operations on the septum; they are now made in forms of softer and more pliable material. When the treatment by cautery and the rectification of septal deformities fails to properly relieve the obstruction, attempts at gradual dilatation by vulcanite bougies have been in my experience more or less disappointing; but I have had most encouraging results from the use of gelatine bougies formed on a rigid nucleus of wire and medicated with iodol, chloride of zinc, etc. In some cases of hypertrophic rhinitis, as well as in many of polypi, collapse of the nostrils remains as a more or less permanent cause of trouble after the original malady has been removed. If unremedied, all the former symptoms are liable to recur. For relief of this condition stimulant smelling-salts, menthol inhalations, and menthol-wool are occasionally all effective. These failing, or as supplementary

to them, I advise gymnastic exercise of the nasal dilator muscles, and once or twice I have found it necessary to resort to faradism.

RHINOSCLEROMA.

This rare disease, which may be considered as a **specific** hypertrophy, and is not limited to the nose, requires but brief mention, as it is not prevalent in Britain; for all the three cases—I am privileged to add a fourth—reported as seen in this country have occurred in patients of foreign nationality.

The disease is one which generally commences at youth or early adolescence, and does not always start in the nose, nor in the mucous membrane, for, like lupus, the skin also is attacked. Pavloff relates a case in which the disease, commencing in the soft palate, subsequently extended to the pharynx, nose, and orbit. The larynx would appear to be infected in only a third or a fourth of all cases.

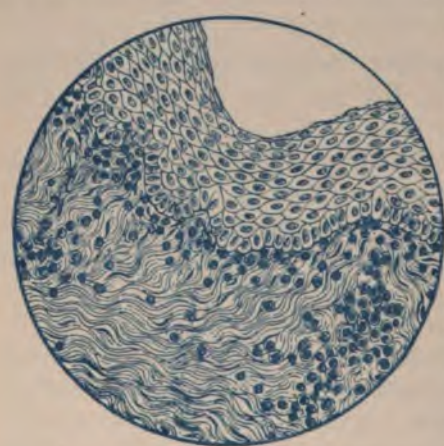


FIG. CCCLIII.—RHINOSCLEROMA ($\frac{1}{8}$ *in Obj.*).

Histologically, rhinoscleroma bears a strong resemblance to lupus, in so far that it is a form of slow chronic inflammation, characterised by the presence of small cell tissue, which spreads in all directions, and undergoes a process of fibrillation or cicatrisation; but it is unlike lupus, inasmuch as that it does not ulcerate unless irritated, and giant cells are extremely rare; vacuolated epitheloid bodies are, however, occasionally present.

The surface epithelium is subject to early invasion, and in some cases seems to be actively engaged, a point which led Tanturni to believe that the disease was primarily due to epithelial ingrowth. Careful examinations show, however, that whilst, as in lupus, groups of epithelial cells may be isolated by the infiltration process, in both diseases they occupy but a passive *rôle* in the surrounding inflammatory changes. Hyaloid spheres are often seen. Fig. CCCLIII. shows a thick layer of stratified epithelium which has replaced the columnar; beneath it are seen numerous

round infiltration cells, which are scattered about the dense fibroid cicatricial tissue, indicative of an advanced stage.

Many **bacteria** have been described as responsible for the disease, amongst which may be mentioned a capsulated bacillus by Cornil, and an intracellular bacillus by Frisch, which, cultivated by Stepanow, has afforded but doubtful inoculation results. This inability to prove that specificity of the micro-organism, constitutes yet another link of resemblance between rhinoscleroma and lupus.

SYMPTOMS.—To the touch the lesion feels like a hard cartilaginous plate or plates, which leads to a widening of the wings of the nostrils; there is no pain, with the exception of tenderness on pressure as in examination with probe. Ulceration is no part of the process, but it may result as a consequence of abrasion.

TREATMENT.—In every case, with one doubtful exception, in which surgical measures aiming at eradication have been tried, the disease has recurred; as, however, it but rarely invades the bones, the only treatment advisable is to combat the tendency to the production of nasal, pharyngeal, and laryngeal stenosis by appropriate operative procedures; tracheotomy, for instance, has more than once been necessary. Internal medication would appear to be useless.

The following is a recent example which was seen at the Central Throat, Nose, and Ear Hospital, in the service of my colleague Dundas Grant:—

CASE CLXXVI.—A Russian woman, æt. 34, married seven years, and resident in England five years, presented herself, in July 1898, on account of obstruction to nasal respiration. The nares were seen to be completely obstructed by pale pink nodular

A. B.

FIG. CCCLIV.

prominences growing from the walls of the vestibule, and at one comparatively flat point in each nostril, presenting a pinhole orifice (Fig. CCCLIVA.). The growth was to be distinguished from lupus by its being entirely confined to the mucous membrane of denser

consistence, and with neither discharge nor crusts, and with no other manifestation on the face or body. The growth was said to have been gradually coming for three years, and at no time had there been either ulceration or epistaxis. In the fauces, the uvula and tonsils were found to be absent, and the whole of the soft palate and the space between the anterior and posterior pillar presented a pale and symmetrically cicatrised surface (Fig. CCCLIVB.). The condition was to be distinguished from tertiary syphilis in the greater regularity of the cicatrix than is usually seen at this site in syphilis, and from any atrophic form of pharyngitis by the fact that the posterior wall was the subject of granular inflammation.

From the tightness of the cicatricial band, no posterior rhinoscopic view was attain-

CCCLV.

able. To the finger introduced behind the velum, the tissues of the choanæ were felt to be very infiltrated and of 'brawny' consistence.

Mr. St. George Reid was so fortunate as to obtain an almost pure cultivation of a capsulated bacillus, resembling that of Cornil (Fig. CCCLV.), while W. Wingrave's examination of the removed portion coincided with the description just given. It may be noted that the slightest attempt at surgical removal was accompanied by *very free* hæmorrhage, a point of some diagnostic importance, and to some extent contra-indicating active interference.

Rhinosclerosis, allied to rhinoscleroma, is a state involving the nasal passages, to which this term might appropriately be applied. It resembles it in so far as it is a low form of sclerotic inflammation of the mucous membrane, tending to obliterate the vestibule of the nostrils by scar tissue, but it differs from it in—

1. The absence of any specific or quasi-specific micro-organism.

2. Its limitation to the nostrils.

3. Its independence of any demographical restrictions.

This infiltration bears a strong resemblance to *syphilitic fibroid degeneration*, which was described, in 1889, by John N. Mackenzie, only that the formation of gummatous or fibroid tumours is not always to be identified as an essential preliminary. Indeed, it often appears to arise as a simple cicatricial deformity, analogous to what is seen in the pharyngeal and naso-pharyngeal region as the result of repair processes, syphilitic or traumatic. We have seen it as the result of long-continued applications of lunar caustic, an agent which appears specially liable to induce an after-sclerosis. In the following recent example no such cause was elicited, nor even a clear history of syphilis, and the probable factor was a general arterial sclerosis which was very plainly manifested.

CASE CLXXVII.—Mr. C., æt. 64, consulted me on April 9, 1898, by the advice of Dr. Foster of Daventry. He stated that he had been ailing for three years with trouble in his kidneys and liver. He had also had two apoplectic strokes, one twelve and the second two years ago. There was now no evidence of paralysis, but his movements were somewhat halting and awkward. During the last three years he had wasted to the extent of 50 lb. His nasal trouble had commenced six months previously with sneezing and coryza. He could now only breathe, and that very imperfectly, by the right nostril. *On examination*, the condition was found as depicted in the drawing (Fig. CCCLVI.), namely, a bony bridge dividing the right nostril, the passages of which were much narrowed, and a complete closure of the left nostril by pale and firm scar tissue, with only one or two pin points of aperture. On further questioning the patient, he said he had always been temperate, had been a widower for thirty years, and had suffered from gonorrhœa twelve years back.

FIG. CCCLVI.—RHINOSCLEROSIS.

His urine was of a specific gravity of 1023, and contained some albumen, but not of measurable quantity.

On 12th April I removed the bridge by cutting forceps, and by the same process broke down the obstruction on the left side. No new formation was found in either nostril behind the site of closure. The hæmorrhage was only moderate, but secondary bleeding took place some hours after, and sanious discharge continued for two or three days. A free passage had, however, been effected, and the patient left London with directions to pass daily a soluble nasal bougie of iodol.

The following is Mr. Wingrave's histological report on the tissue removed :—

That portion marked *right* nostril consisted for the most part of dense fibroid bundles mingled with albuminous and mucous glands. The arterial walls showed marked sclerosis, which process had also involved the nerve fibres. Patches of yellow pigment were seen. The surface epithelium was partly normal columnar ciliated and partly stratified.

The portion from the *left* nostril was entirely fibroid tissue, with a few gland ducts and sclerosed arteries and small patches of inflammatory or infiltration cell tissue.

The nature of the foregoing changes is purely innocent, and probably one of a slow inflammatory nature associated with irritation.

The exaggerated degree of arterial sclerosis is strongly suggestive of tertiary syphilitic

changes. The dense fibrosis is consistent with that disease and rhinoscleroma (or rather rhinosclerosis.—L. B.).

Atrophic Rhinitis.

Varieties: Simple, or non-fœtid; and specific, or fœtid.

The literature of atrophic rhinitis is so voluminous, and indeed so contradictory, that I shall avoid as much as possible quoting authorities, and shall content myself with stating those views which after long observation I have adopted, in the belief that they represent those nearest the truth.

The terms atrophic and dry rhinitis, implying as they do shrinking and desiccation of the nasal mucosa, have been used by many writers as synonymous with ozæna. Tuberculous and syphilitic diseases of the nose, with fœtid symptoms, have also been spoken of as ozæna, so that the term has been applied, even by special authorities, and quite commonly by the profession at large, to represent disease *per se*. **Ozæna** is, however, as its Greek derivative, or its French and German synonyms, *punaisie* and *stinknase*, clearly indicate, but a symptom, *frequent* and indeed almost *constant* in atrophic rhinitis; *occasional* or almost infrequent in hypertrophic rhinitis—both non-ulcerative diseases; and *invariable* in the case of syphilitic and tuberculous—ulcerative diseases of the nose. I here restrict the term atrophic rhinitis to a dry, non-ulcerative shrinking process of the mucous membrane and spongy bones, characterised by abnormal roominess and patency of the choanæ, diminished secretion, the formation of crusts, and in most cases by fœtor, the last symptom being manifested in varying grades at varying periods of the disease.

Etiology and Pathology.—In the chapter on general etiology I have pointed out that hypertrophy is sometimes the antecedent of atrophy, but there are also numbers of cases which take on an atrophic condition without having passed through a previous hypertrophic stage. Morell Mackenzie probably represents a large consensus of opinion when he writes: 'Atrophy appears to be always a secondary affection.' My own notion, however, is that atrophy is often primary, in the sense of not being secondary to any previous pathological process *in the nose*, although in such cases I would be the first to admit that the pathological change is really due to a morbid diathetic state of the system. This, however, is not what Mackenzie means, for he is distinctly of opinion that the disease is not constitutional, and therefore not secondary in this sense. I think I have satisfied myself that in a number of

instances, in addition to a predisposing constitutional weakness, which is usually strumous in character, one other factor of importance is almost invariably present, viz. an abnormal patency of the anterior nares, with an upturned condition of the nose. This excessive patency and 'tip-tilting' of the nostril (Fig. CCCLVII.) is not dependent on any morbid process in the septum, as is seen in ulcerative syphilitic diseases, but is a congenital feature, which presents an aberrant type in the evolution of the fronto-nasal plate. Thus the anterior aperture of the nostril, instead of

FIG. CCCLVII.—FACIAL TYPE IN ATROPHIC RHINITIS.

looking almost directly downwards, looks more or less forwards, and so allows the air-current to pass directly into the inferior meatus. This direct intake of the breath is favoured by the greater width of the nostrils, and by the absence of vibrissæ, an early evidence of the atrophic process. The air, therefore, passes straight through the inferior meatus to the pharynx, instead of traversing the middle and superior parts of the nasal cavities; and as a consequence there is insufficient diffusion with the warmed and moistened air of the nasal fossæ and of the accessory

sinuses,—the nasal reservoirs. The mucosa of the lower meatus being overworked, is rendered still more sensitive to irritation of the constantly dust-laden atmosphere. Moreover, if there be any strumous or other constitutional vulnerability, the inability to recover from slight irritation will result in the destruction of cilia, and in consequent stagnation and drying of secretion, as the first step in the pathological process of so-called idiopathic atrophy. I have used the qualification 'so-called,' because it is clearly a misnomer to apply the term 'atrophy' to a structure which has never been satisfactorily developed, for in these instances there is evidently a want of correlation between the growth of the child and of the ethmoid structures. To this condition Wyatt Wingrave offers the alternative term 'dystrophic.' Conversely, we have a 'so-called' hypertrophy of the nasal structures of children occurring before puberty, in which the growth of the turbinal is in excess of the growth of the child.

Consideration of the foregoing will indicate that there is even greater difficulty in arriving at the **relative frequency** of atrophic rhinitis than in the case of the hypertrophic. Nevertheless it may be remarked that the proportion has been very equally maintained in our **Hospital Statistics** during the ten years from which our deductions are drawn; and it would appear that atrophic rhinitis occurs in 15 per cent. of all diseases of the nasal fossæ, and in about 4.3 per cent. of all affections of the nose, throat, and larynx.

As predisposing factors in the process must be mentioned age and sex. The disease is most prevalent in young adults of the female sex, and in many cases first becomes objectively evident to non-medical observers about the age of puberty, possibly because the resulting ozæna is more marked at the menstrual periods. But not only is atrophic rhinitis to be found in individuals who, having arrived at puberty, are amenorrhæic, and in later years perhaps menorrhagic, but I have seen so many cases of the disease commencing in young children at the age of seven and eight, in whom the menstrual epoch has afterwards been abnormally delayed, that I cannot doubt the causal connection between wasting or non-development of the erectile tissues of the nasal fossæ and a similar condition of the female generative organs. More rarely one may see cases which appear to have commenced with the menopause. I have also satisfied myself that there is much truth in J. N. Mackenzie's view as to the association of other kinds of sexual sympathy and irritation as factors of nasal disease generally, and of the atrophic form in particular.

As regards *secondary* atrophic rhinitis, I have already explained how it occasionally follows simple non-fœtid hypertrophy. Cases of hypertrophic rhinitis which become complicated by fœtor probably end in atrophy by irritation of the essential ozænic factors, to be presently described. Atrophy is sometimes secondary to suppurative catarrh of the maxillary antrum from dental disease; most cases of unilateral ozæna are of this nature, though the existence of a similar affection of other accessory cavities, especially the frontal, must be also borne in mind. Clinical experience, confirmed by cadaveric and microscopic examination, has assured me that suppurative discharges from the accessory cavities are often attended by a shrinking of the tissues and by bone absorption. As previously stated, although dry or atrophic catarrh is not always accompanied by ozænic symptoms at an early stage, it is probable that they invariably supervene sooner or later.

I have up to this point avoided entering into the question of the cause of the ozæna. If we were dealing with a disease involving ulceration, and especially ulceration of bone (caries), it would be easy to understand the presence of a foul-smelling odour; but in true, uncomplicated, atrophic rhinitis there is no ulceration except such as is artificially produced in removing crusts; and the smell of caries is quite unlike the unique specific fœtor known as ozæna. Various explanations as to the cause of this peculiar fœtor have been suggested, of which the following only are worth considering:—(1) It has been held to be due to suppurating discharges in the accessory sinuses; but this does not explain *why* this specific, unique odour should issue from the sinuses. Moreover, it is rarely that the smell of pus in the antrum and other sinuses is truly ozænic. (2) It has been considered due to the fatty degenerative changes which admittedly often take place in the cells of the racemose glands. (3) In recent times it was inevitable that an explanation would be sought for in the direction of fermentative changes, and in the life processes of micro-organisms. Both B. and E. Fränkel endeavoured to prove the point by examining plugs of cotton-wool which had remained in the nose for some hours after they had been introduced by Gottstein's method. They found a number of microbes present. Loewenberg and others have, however, pointed out that in such an experiment only an aëroscopic cultivation is made of the prevailing organisms in the atmosphere which happened to be present in the nose at the time. Such an experiment failed to prove *specificity*. Loewenberg, on the other hand, claims, as the result of his culti-

vation experiments from ozænic crusts, that the unique fœtor, so easily recognised yet hardly to be described, is invariably associated with the presence of a large diplococcus. He claims to have found it *always* present in the ozæna which occasionally accompanies hypertrophy, as well as in that of atrophy of the mucosa. He has never, after repeated cultivations, found it present in those simple forms of rhinitis in which ozænic fœtor has not yet appeared. He therefore claims that this large diplococcus is the specific cause of ozæna. In some recent cases which I have had bacteriologically examined for me, the organism has nearly always been found; but as we have already seen that a diplococcus conforming to Loewenberg's description is an almost constant feature of nasal discharge, even of a simple acute catarrh, its specificity in ozæna cannot be admitted.

Whilst feeling strongly that all such advances in our knowledge must ultimately prove of practical utility, I am bound to suggest that the smell is so characteristic of itself, that it is quite unnecessary for diagnostic purposes to look for the diplococcus, and Loewenberg's discovery, accepting the microbe to be the cause of the ozænic fœtor, brings us no further forward as regards treatment, for germicidal and deodorising therapeutics have been adopted by anticipation for many years, and with but moderate success. Loewenberg believes that the diplococcus finds a favourable nidus before ozæna is well marked, and that its discovery is of use in diagnosing those cases of hypertrophy which are likely to terminate in atrophy before fœtor has appeared. Proof of this is unfortunately just what is wanting at present.

A last suggestion offers, namely, that the disposition to a dermal reversion in the mucous membrane, consequent on the more direct irritation of the inhaled atmosphere through abnormally open nostrils, may lead to a disorder in function not unlike what occurs in disordered secretion of the skin, as exemplified in fœtid sweating.

Diagnosis.—I am in the habit of differentiating the true ozænic odour from (1) the fœtor of pus met with in suppurative catarrh of the sinuses, especially in polypus and in hypertrophy; (2) from that due to decomposition of retained and inspissated secretions forming the crusts of atrophic rhinitis; and (3) from the smell associated with carious processes in the bone and cartilage in connection with syphilis and tuberculosis, as also with various poisons which lead to death of the rhinal structures.

Not only can these odours to my sense be distinctly differentiated, but their behaviour under the use of a deodorant douche constitutes a diagnostic point of almost unfailing constancy and importance. (1) In the case of pus there will be no malodour for upwards of twenty-four hours after the douche, and, moreover, the patient is made conscious of its reaccumulation by taste and nausea. (2) Thorough removal of the crusts and free douching will render the subject of ozæna due to atrophic rhinitis quite fit for society, provided the process is unremittingly pursued twice every twenty-four hours, except perhaps at or near to the catamenial period, when it should be adopted more frequently, since at this time the stench is always more intense. Another diagnostic point is that the subject of atrophic rhinitis is, as a rule, unaware of the disagreeable character of the breath, a point of similarity with *bromidrosis.* (3) When there is actual caries or necrosis, the deodorising effect of irrigation is very evanescent; the odour is, moreover, far more penetrating, and is also a constant factor of discomfort and distress to the patient.

Histo-Pathology.—The microscopical evidence is strongly suggestive that two processes are at work in this disease: (1) A low form of inflammatory infiltration followed by sclerotic changes; and (2) a simple and primary atrophic change involving all the elements of the nasal and pharyngeal mucous membrane. Each case is marked sooner or later by shrinking of the mucous membrane and 'crust' formation without ulceration or extension to the skin.

The morbid details may be briefly summarised under the following seven divisions:—

1. Transformation of the normal surface cells into a thick layer of stratified squamous epithelium.

2. Disappearance of the hyaline basement membrane.

3. Early activity of lymphoid and small cell tissue, which later undergoes atrophy and sclerosis with thickening of the small arteries and obliteration of capillaries,—changes which are strongly suggestive of a slow inflammatory process.

4. Appearance of hyaloid bodies, singly or in clusters, varying in size from that of a red corpuscle to $\frac{1}{800}$ in. In advanced stages these bodies are much larger; they lose their spherical shape, and appear to break up into small irregular-formed particles. They are widely distributed in the different tissues, but are more numerous in the small cell tissues. As to their nature and significance, some are probably identical with the 'fungus parasites' occurring in cancer, hypertrophied tonsils, and

other chronic inflammations (Russell's and De Simoni's bodies), whilst others may be simply products of cell degeneration or fibrinous intravascular coagulation. The spheres stain deeply by Gram's method, a circumstance which points to a parasitic nature, whilst the larger and irregular masses seem to more readily select the orange stain, a quality suggestive of cell degeneration, coagulation products, or a perverted cell metabolism.

5. The *gland changes* vary from simple cloudy swelling of the secretory cells to a complete disorganisation and disappearance, due to invasion by inflammatory cell tissue. The ducts generally resist all changes until the disease is far advanced, when the 'palisade' lining is replaced by plugs of laminated keratin cells.

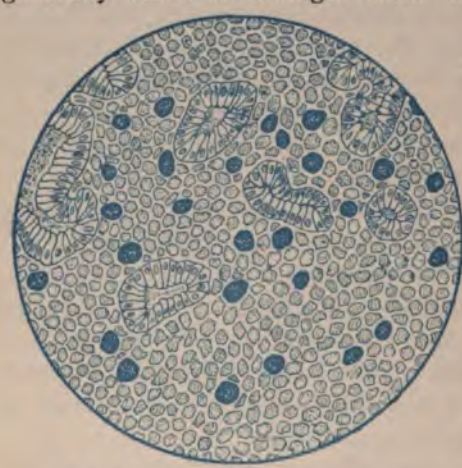


FIG. CCCLVIII.—ATROPHIC RHINITIS ($\frac{1}{6}$ *in. Obj.*).

6. *The osseous changes* indicate an exaggeration of osteo-porotic absorption leading to diminution in the bulk and excessive brittleness of the turbinal bones themselves. This process must be always interpreted as passive and sequential, though the opposite view has been advanced.

7. *Changes in the nerves.*—Careful examination has in many instances shown a true degeneration of the nerve fibres themselves. Small-cell tissue can be seen replacing the endomysium, and compressing the fibres which eventually undergo sclerotic changes.

Nature of the 'crusts.'—Microscopically the crusts consist of multinucleated lymphocytes, nucleated and non-nucleated squames, with several of the following bacteria:—

1. Giant diplococcus (Loewenberg).
2. Bacillus coli communis.
3. Diplococcus pneumoniæ.
4. Staphylococcus pyogenes aureus.
5. Bacillus fœtidus.
6. Bacillus of Friedlander.
7. Bacillus ulna of Vignal.

Nos. 1, 2, 3, and 5 are most frequently present, but efforts have, however, not yet been successful in finding a micro-organism which could be unequivocally considered specific.

Chemically, the crusts consist of mucin, cell globulin, and serum albumen, with traces of sulphur and phosphorus.

Of *incidental pathological changes* the most striking is the disappearance of lymphoid structures, such as faucial, pharyngeal, and lingual tonsils; caries of teeth; smallness of the thyroid gland; non-suppurative dry catarrh of the middle ear; and general anæmia.

TREATMENT is always tedious, and often most unsatisfactory; but I cannot admit that it is always so hopeless as is generally asserted. The younger the patient the more likely is treatment to be successful. In cases which occur after the period of puberty, and as the probable result of a chronic hypertrophy, of a pernicious blood supply, or as the sequel of a fever, the prospects of success are less encouraging.

Remedial measures that may be pursued by the patient are fourfold: (1) By syringing and spraying, to moisten the incrustations and retained secretions, never attempting to remove them by force or without such previous softening; (2) by further washing with anterior or posterior douches, to clear away the same; (3) by inunctions, to obviate the continuance of the desiccation of the mucus and the re-formation of the scabs; (4) by modifying the undue patency of the nostrils, and providing a substitute for the shrunken turbinals. With this view I have advantageously prescribed the insertion into the nostril of lightly carded fragments of wool medicated with iodol or menthol. All of these remedies may be made to assist in a general antiseptic, detergent, or oxygen-generating process; and for this purpose several formulæ are appended.

The main point in treatment is to insist on the necessity for perseverance; it may even require to be pursued for the rest of the patient's life; and as individuals are seldom conscious of the offensive character of the breath, I always encourage them not to be averse to a reminder from friends and relatives when there is a relapse, so that renewed activity in remedies may be exercised. In any case, douches and inunction should be employed night and morning, and occasionally at noon also. Beyond these local measures, the constitutional defects must be carefully combated by appropriate drugs, diet, and hygiene. Development of delayed menstrual function and correction of all causes of an excessive catamenial flow, are points to be never omitted in the

treatment of ozæna in females. The constant galvanic current is serviceable in restoring tone, and has been claimed when applied locally to effect an absolute cure; and the same may be said of electrolysis. The exhalations from the mud of the Bristol Channel in that district are said to be of value on account of its bromo-iodine constituents, and residence at Weston-super-Mare has proved of advantage in several children who have been educated there by my advice.

The question remains, Can the disease be cured? The answer lies in the view taken of the morbid process. Granted that when once the ciliated epithelium and vascular tissue are destroyed they cannot be replaced, and that therefore the normal character of the membrane can never be restored, much may be done to counterbalance this loss by stimulation to more active capillary circulation, and this especially where the diseased condition appears to be due to retrograde changes consequent on arrest of development rather than to actual atrophy. In no way can this desirable end be so effectually achieved as by occasional light searing with the galvano-cautery, so as to set up active granulation. This process may be reinforced by stimulating inunctions, as of iodoform, iodol, or menthol. I am happy in the experience of many cases in which perseverance in such a course has been rewarded by a large measure of success, amounting, indeed, practically to a cure. It is true that in many cases the patient has been obliged to continue the employment of the douches and inunctions just indicated; but the chief and most distressing symptom—namely, the *ozæna*—has been thereby completely nullified, while the dryness of the throat, the deafness, headache, and digestive disorders have all been reduced to a minimum.

Several specialists have pointed out the value of direct irritation of the turbinal bodies as a remedial agent of importance, such as the introduction into the nostrils of little rolls of a cantharidine plaster known as 'canthos cotton'; or the application of diluted trichloracetic acid in a spray.

I have seen beneficial results from both these measures, especially the former, combined—be it always remembered—with the persevering use of antiseptics diffused by the coarse spray; and the success has been the greater, the higher the social grade of the patient, in which class apathy, the great obstacle to permanent improvement, is less likely to prevail.

Curetting is advocated by those who confuse the osseous degenerations incidental to ozæna with those of primary morbid

changes in the ethmoidal and sphenoidal sinuses. Directions for this kind of treatment will be given more appropriately in the next chapter, which deals with Diseases of the Accessory Cavities.

Braun has advocated **vibratory massage,** by special small instruments, with a view, I presume, to encourage nutrition; and Garnault of Paris has supported him in his reports, which are of a somewhat confident nature.

Serum-therapy has not as yet yielded any satisfactory or even encouraging results; nor could such be expected, seeing that up to now, notwithstanding the probability of the bacterial nature of the disease, its specificity has not been established. The application of anti-diphtherial serum has been seriously advised, on the ground that there is a resemblance between the organism of diphtheria and that of ozæna,—an assertion and a recommendation eminently calculated to cast ridicule on the science of bacteriology and on all remedies based upon its teachings. Any good results that have as yet been obtained by such injections, have been referable rather to a consequent improvement of blood quality due to the serum, than to any special antitoxic element contained in the remedy.

Atrophic rhinitis depending on **syphilis** will be considered under the heading of Perforation of the Septum, while that arising as a result of either **lupus** or **lepra** has been alluded to in the chapters which treat of those diseases in the regions of the throat. A few more words may be added as regards lupus.

Lupus.—The liability for the **fossæ** to be early attacked is explained by Hunt to be due to its proneness to abrasion during nasal catarrh, and for the same reason of greater susceptibility to trauma he attributes the preference of the uvula and epiglottis. This author thinks that in cases of nasal lupus the disease really originates often in the mucous membrane and spreads outwards to the skin,—a point very difficult to settle. Moreover, there appears to be a proneness for lupus to attack by preference parts in which cartilage predominates. There is, however, but little doubt in my mind that, though such may be the case in the rare instances in which the throat is attacked before the skin, the more usual sequence is for the mucous membrane to be invaded secondarily to the skin, and in my judgment this is simply by contiguity. There is little evidence to favour the view that it is conveyed any distance through the lymphatics, or by absorption. Hutchinson has explained that the reason why lupus is so much

more destructive of tissue in the alæ and septum of the nose, lips, and soft palate,—and I might add epiglottis and ventricular bands, and in the ear,—is that the ulceration spreading by continuity attacks the two opposite surfaces of these regions almost concurrently. The cases in which an invasion of lupus extends beyond the cartilage and attacks the nasal bones are so rare, as to imply serious doubt whether it ever occurs except there be a co-added syphilitic history.

Case CLXXVIII.—M. M., æt. 46, female, presented herself at the Central Throat and Ear Hospital, on January 11, 1892, complaining of 'pain in her throat' of two months' duration. She had suffered with nasal stuffiness for eight or nine years, and had been under treatment for polypus of the nose, for lupus of the nose, and for inflamed ankle joint, the nature of which was obscure. She was also the subject of frequent 'gatherings' on her fingers, general debility, and 'colds in the nose.' Had been delivered of one child, which was born at the eighth month, and lived four weeks only.

State on admission: Has a very unpleasant smell from her nose, a persistent tickling in her throat, especially when in bed, and her mouth is always dry in the morning. She cannot appreciate the smell of strong coffee, tea, or cooked meats.

Both nostrils are found to be obstructed, the left more than the right. In the *right* is seen an irregular, bright pink, spongy granulation mass, apparently springing from a hypertrophied septum. The middle turbinal cannot be seen, but the inferior is observed to be swollen and pale in contrast. The *left* nostril is chiefly occupied by similar granulation masses, growing from the middle turbinal. They are paler than those on the septum in the right nostril, and readily bleed on probing. The inferior turbinal on this side is also hypertrophied, and still paler than the new tissue. There is well-marked pharyngitis lateralis.

Has not lost weight, and is not troubled with night sweats. The lungs are normal, with the exception of some harsh breathing over both apices. The expectoration is rather free, but contains no bacilli of tubercle and no elastic tissue.

A portion of the growth from the middle turbinal was removed, and on examination Mr. Wingrave found as follows:—

'The greater part of the structure removed consisted of small cell-inflammatory tissue covered with plain columnar and columnar ciliated epithelium. Mucoid degeneration is well marked in some places, whilst in others masses of cell-clusters are seen, resembling, and possibly identical with, "giant cells." Blood vessels are plentiful, and their walls show marked fibrosis, whilst here and there epitheloid proliferation has blocked the lumen. Very little erectile tissue can be made out, as it is invaded by the small cells. Cyst-like invaginations of columnar epithelium are shown in several of the sections, whilst normal mucous acini are fairly numerous. Lastly, the bone and periosteum are found to be perfectly healthy, excepting that here and there the small cell tissue appears to be invading the cancellous spaces. *There is no necrosis.*'

The treatment adopted was that of curetting, and free application of a 60 per cent. solution of lactic acid, the parts having been previously well cocainised. She made an excellent recovery, and on March 20, 1893, fifteen months after she first came under my care, she presented herself again at the hospital, and reported that she was quite well.

Tuberculosis may also be manifested in the nares, but there are no special grounds for separate remarks. In spite of some

recent observations, it must be always conceded that the disease in this region is both rare in circumstance and as a primary or early process. It is also to be noted that, for identification of the specific bacilli, it is necessary to make a scraping in the deeper structures. No hesitation need exist as to this procedure, since free curettement is an essential to eradication of the mischief. Its local manifestations may be afterwards treated by applications of lactic acid, and the symptoms will be further relieved by menthol, iodol, or aristol in ethereal or oily sprays, and by other antiseptics or sedatives, administered by means of medicated wools, or by oro-nasal inhalers.

RHINITIS CASEOSA.

This is a curious nasal condition, in which the upper part of the nasal fossæ are blocked, as the name implies, by a cheesy or putty-like material; it is found either in debilitated strumous subjects or as an associate of polypi. As far as I am aware, no satisfactory account has been given of the pathology of this condition; it does not seem either like degenerated polypi or mucous membrane, but rather as a fatty, long-retained, morbid secretion, originating in the superior meatus, or in the frontal, ethmoidal, and sphenoidal sinuses, and the increased attention recently given to diseases of the accessory cavities has led us to the belief that the affection is due to an accumulation of caseated pus in one or other of these spaces. The sphenoidal sinus has been observed in several instances to be nearly filled with this caseous material, in dissection-room subjects of advanced years, in which no bone disease was evident. The condition is an obstinate one. Anosmia and headache are prominent symptoms; but fœtor is not always evident to the patient, obvious as it is to the observer.

TREATMENT.—I should recommend persistent but careful scooping away of the masses, and curetting of the cavities involved, when such a procedure is possible. The coarse spray may also be used with some antiseptic lotion; constitutional medication and a generous diet should never be omitted. The **prognosis** is favourable, if both surgeon and patient will persevere to complete eradication of the disease.

GLANDERS.

Allusion has been made to liability for this infectious malady to extend to the larynx in its acute form. But in its chronic variety it may originate in the nasal fossæ.

Glanders is a specific infectious disease, the bacillus of which was discovered by Löffler. The malady is sufficiently common amongst horses, whence it is with rarity conveyed to man, and mainly to those occupied in stables, for 60 per cent. of human beings infected are found to definitely come under this class. A large proportion of the rest are the subjects of more or less direct contagion from the horse; and though the transmission from man to man is possible, it is not frequent.

The chief features of the disease in its **acute** stage as it attacks the nose are, first, considerable inflammation and swelling in the nasal passages, extending both to the face and by the naso-pharynx to the throat; then occurs discharge, profuse, sanious, and fœtid.

Constitutional infection is marked by fever and prostration. The **prognosis** is most grave, few patients recovering. The **duration** seldom extends beyond fifteen or twenty days, and death takes place from coma and collapse. **Treatment** consists of *internal* remedies of an analeptic character, such as quinine and iron; while, *locally*, all that can be done is to promote antisepsis by appropriate douches and sprays.

Should the malady pass into the **chronic** form, the rhinal discharge may diminish, to be succeeded by ulcerations, septal perforation, and incrustations. In these circumstances the case may be mistaken for syphilis. The response to an injection of mallein should decide the question.

II. *MORBID CONDITIONS OF THE OSTEO-CARTILAGINOUS FRAMEWORK AND SEPTUM.*

In considering the diseases of this portion of the nose, the reader is recommended to refer back to that portion of the anatomy which deals in detail with the structure of the septum (Chapter III., p. 67).

MALFORMATIONS.

According to our arrangement in other regions of the respiratory passages, deformities are to be considered as (1) **Congenital,** and (2) **Acquired.** The first only merit special remark, and they may be subdivided into anterior and posterior.

Of the **anterior** there are two varieties; the first is repre-

sented as an exaggeration of the *limen vestibuli*, a point of demarcation between the cutaneous or vestibular lining and the respiratory or mucous membrane proper. This may vary in degree from a slight narrowing to an almost imperforate diaphragm. The second anterior deformity is shown in the persistence of the vertical direction of the nostrils normal to children at birth.

Posterior malformations consist in a varying degree of occlusion. This may affect both nostrils or only one. It may also be bony or membranous. The origin of the deformity is due to a disproportionate development between the vertical or ethmo-vomerine plate and the cartilaginous nasal capsule. It is probable that the first cause of the trouble is an inflammation of fœtal structures due to rickets or syphilis. When the occlusion is complete, evidence of the deformity is manifested very soon after birth by the inability of the infant to take the breast. When only unilateral the condition may be overlooked.

Acquired deformities of the external nose—mostly due to traumatism, and some congenital varieties of configuration—such as the 'pug' and the 'saddle' nose, have been surgically treated by American rhinologists, especially by Roe.

The cosmetic results, as illustrated by photographs, have been brilliant, and the methods, which are most ingenious, deserve the attention of the general surgeons of this country; but the subject hardly comes within the scope of this volume.

Hæmatoma of the Septum is the result of traumatism, and may be either bilateral or unilateral,—in my experience usually the latter. There is frequently general œdema of the external nose, which may extend to the forehead, and even to the eyelids and cheeks. The condition, which depends on the accumulation of blood between the mucous membrane and the periosteum of the osteo-cartilaginous framework, may be mistaken for polypus. If unrelieved by aspiration or incision, the blood-tumour is either gradually absorbed, or else it terminates in **Abscess of the Septum.** This latter condition is not, however, always preceded by hæmatoma, for traumatism may lead to caries of the bone or cartilage, which may result in perforation and asymmetrical suppuration; in this last case evacuation of the pus is of course indicated. Hæmatoma may be confounded with a syphilitic gumma of the septum; such a cause should be suspected where there is no history of trauma, and appropriate local and constitutional treatment should be adopted. Reverting

to abscess, it may be noted that this occurs as an affection of middle life or old age. The point for evacuation by incision may be either in the nostril, or, in the event of extension, in the buccal vestibule inside the upper lip, above the central incisors; this site constituting that of least resistance.

Perforations of the Septum.

Perforations of the septum may be *traumatic* or *dyscrasic*. The first result as part of the operative treatment of obstructive deviations, and are sometimes effected purposely, sometimes inadvertently. The small openings thus made, while often productive of great relief to stenotic symptoms, are never followed by any destructive ulceration; and generally the patient, unless informed, is unaware of their existence.

The time is now gone by when all perforations of the septum, excepting those of traumatic origin, should be regarded as evidences of a syphilitic dyscrasia. **Syphilitic** perforation is probably always associated with necrosis of some portion of the ethmoid bone in addition to the perpendicular plate, and fœtor is never absent. It may commence as a gumma. The following two cases, which came under my notice on the same day, at a visit to the hospital, are illustrations of this form of specific perforation in the adult:—

Case CLXXIX.—M. B——, æt. 50, presented herself at the hospital, January 27, 1890, complaining of having suffered pain for the last year on the left side of the throat, especially on swallowing, and from excessive purulent discharge from the nostril. Her voice was toneless, and her articulation thick. On examination, the whole of the left side of the soft palate, and a portion of the right, was seen to have been destroyed by ulceration, and a large perforating ulcer existed at the situation of the left tonsil. The septum nasi was perforated to the size of a threepenny-bit, and ulceration was still active. She had suffered from dimness of vision for three years, and was at present the subject of choroiditis of the left eye. It was elicited on further interrogation, that of seven children, three had been born dead, two had survived but a few weeks, and the last two were living and comparatively healthy.

The eroding process was arrested by local galvano-cauterisation to both septum and palate, the use of iodol ointment to the nose, and chlorate of potash as a gargle to the throat, together with the internal administration of the biniodide of mercury.

Case CLXXX.—M. B——, æt. 24, dressmaker, applied the same day as above, complaining only of pain in the nose, from which she had suffered for two years. On examination, the septum was found to be deviated to the left side, and perforated by ulceration, which had evidently commenced on the right side, and had extended through so as to produce ulceration of both the left inferior and left middle turbinated bodies. Although it was difficult to obtain an absolute 'specific' history in this case, the fact was elicited that there had been a suspicious skin eruption, loss of hair, and 'inflamed lumps' (nodes) on the shin bones. Improvement took place under the internal administration of biniodide of mercury and the local application of nitrate of silver, followed by ointment of iodol.

On the other hand, the perforations met with in **strumous** persons are usually limited to the triangular cartilage, and the erosive process shows no disposition to attack the bony septum. Such perforations frequently result from the practice, not only in children, but also in adults, of picking the nose; it is probable that the irritation which induces picking is caused by hairs, and by accumulations and crusts on slight spurs; the resultant erosion leads to hæmorrhage, and the habit thus set up eventually ends in perforation of the triangular cartilage. Such openings, though sometimes large, rarely give rise to deformity or falling in of the nose, as is rather the rule in syphilis, when it is the result not only of bone destruction but of cicatricial contraction.

Another class of perforations are those resulting from **hæmorrhagic and debilitating illnesses,** such as typhus and small-pox. They are also not uncommon in those who have resided in India, or other hot climates. The following represent types of these two classes:—

CASE CLXXXI.—C. A——, æt. 24, a waiter, consulted me for a perforation of the septum. He had a severe attack of variola between the ages of two and three years. As long as he can remember he has always 'felt something the matter with his nose.' At various periods there has been a discharge from the nostrils, sometimes offensive. His senses of smell and taste are 'not so good as they were.'

On examination, there were the usual appearances of perforated septum, evidently of long standing. In its present state, and probably for a long time past, the inconvenience experienced was not due to any advance of the ulcerative process, but to retention and inspissation of the secretions, leading to the formation and deposit of crusts.

It appeared evident from the history and appearance, that this condition resulted from the attack of small-pox at the age of two years.

The treatment adopted was a nasal spray of iodol and menthol in olive oil, and an ointment containing 15 grains of iodol to ℥i of vaseline.

CASE CLXXXII.—A female, æt. 24, came under my care early in 1887 at the hospital on account of a nasal perforation, which she stated had originated as a sequel of *variola*. Anti-syphilitic treatment, which she had undergone at the hands of another specialist, had only increased her suffering, and continual application of mercurial ointment had led to frequent epistaxis.

CASE CLXXXIII.—Dr. ——, æt. 42, of the Army Medical Staff, consulted me in 1866 on account of a small perforation in the cartilaginous septum. He stated that he had always been subject to slight erosions and incrustations inside the nose. These he had picked away, with the result generally of causing slight hæmorrhage. While serving a few months previously in the Soudan, he perceived one morning that the septum had given way, and a small hole was formed which had since increased to its present size,—a quarter of an inch in diameter. Ulceration had been for some time arrested. I advised simple inunction to prevent irritation and the further formation of crusts.

Perforation from **chromic** acid and **phosphorus** poisoning, or from the virus of **malignant** types of **fevers,** represents an acute

process which rapidly destroys the cartilage, but only infrequently causes marked destruction of bone. Deformity is only an occasional result; and bone is never attacked, except in the case of syphilis or leprosy, and — *very rarely* — in that of lupus.

There is yet another class, which, in the absence of evidence of any local or constitutional disease, admits only of interpretation as of **troph-neurotic** origin.

TREATMENT.—In addition to constitutional measures directed against any specific dyscrasia, and generous diet, energetic local medication in the shape of antiseptic sprays, and unguents or bougies of iodol or sozo-iodol, are indicated; cessation of any habit likely to keep up irritation is also to be rigorously enforced. The entire closing of a perforation by healing process is unknown in my experience, and it is doubtful if such a happy result ever occurs; but spontaneous or induced arrest of ulceration is the rule.

DEVIATIONS AND DEFORMITIES OF THE SEPTUM.

Independently of the seriously disfiguring external deformities that result from violent accidents to the nose, well-marked deflections, and bony as well as cartilaginous outgrowths or spurs, of the septum, to be seen only on anterior rhinoscopic examination, are exceedingly common, and constitute, in spite of repeated records, a still generally unrecognised or unacknowledged cause of grave nasal trouble, or of a distressing reflex disturbance.

A perfectly symmetrical septum would appear, from the observations of Zuckerkandl, Morell Mackenzie, and others, to be the exception rather than the rule. Thus, out of a total of 2276 skulls examined by Mackenzie, Theile, Semeleder, and Harrison Allen, there was conspicuous deviation in about 75 per cent. In 370 crania inspected by Zuckerkandl, there were spurs or deflections in 140, that is, in 37.8 per cent.; whilst the proportion between symmetrical and asymmetrical septa in Europeans is as 1 to 3, it is in the Aborigines of Africa, America, and Australasia as 4 to 1, a curious and somewhat significant fact. It must be understood that these statistics apply to deviations (of more than half a millimetre) of the bony septum, and do not include deformities of the cartilaginous area. A large number, however, of the anterior spurs on which I have operated, and of which I have kept records, were cartilaginous, and it is therefore evident that the numbers deducible from the examination of dried skulls

understate the frequency of septal deviations. On the other hand, we are not in possession of trustworthy statistics *on a large scale* of the proportion of cases of septal deformity which cause symptoms requiring operative relief, to the whole number of cases of nasal disease, and of the number of cases which are aggravated, but not actually caused, by the septal asymmetry. Of 200 cases

Drawing made from Specimen in Army Medical Museum, Washington. No. 2347.

FIG. CCCLIX.—CORONAL SECTION, showing septum deviated to the left, with osteo-ecchondrosis or spur (probably traumatic) ascending obliquely along upper vomerine suture. The outgrowth is most marked in the inferior meatus. On account of the slightly sigmoid character of the deviation, there is an enlargement of the right inferior and left middle meatus, with compensatory hypertrophy of their respective turbinals.

The left middle turbinated body has been sectionised so as to show its cavity: the antral cavities are seen to be somewhat asymmetrical.

of nasal obstruction tabulated by my colleague, Dundas Grant, there were septal deviations of such magnitude, position, or hyper-sensibility as to be considered the source of one or more symptoms in 33.5 per cent. These deviations were associated with hypertrophic rhinitis in 27.5 per cent., and uncomplicated in 6 per cent., of the whole number.

As regards age, Zuckerkandl's statement that the septum is

rarely deflected before the seventh year, is at variance with older notions, though the fact that it is quoted without question by eminent authorities would appear to show that it is corroborated by clinical experience. Probably this immunity in early years of life can be readily explained on anatomical and physiological grounds. Certainly the youngest case in which I have found it necessary to operate was that of a little boy eleven years of age, and his septal deviation was directly due to traumatism (fall from

Drawing made from Specimen in Army Medical Museum, Washington. No. 2348.

FIG. CCCLX.—CORONAL SECTION, made posteriorly to that of the preceding figure, through the lesser wings of the sphenoid. Here is also shown a sigmoid deviation, but the spur on the left side is somewhat obscured by shading. There is especially marked thickening of the perpendicular plate of the ethmoid. The openings of the upper ethmoidal cells are well shown, and the general asymmetry of the turbinated bodies, so commonly existing, is well demonstrated.

a wall) five years previously. The point is such an important one, that further observations in other countries would be interesting, whether confirmatory or otherwise.

ETIOLOGY.—Excluding true fractures, which usually take place along the upper border of the vomer, and are due to marked traumatism, numerous causes have been assigned as accounting for septal deformities. Deviations with buttress-like spurs have been considered to arise from such slight traumatic influences as using the handkerchief with the same hand and sleeping on a

certain side; and a method of manipulative treatment to correct external deformity has been founded on these hypotheses.

The appearance of a deviated septum examined post-mortem almost irresistibly points to the conclusion that a deflection, unconnected with traumatism, usually represents an overgrown septum; in other words, there is want of correlation between the growth of the septum and the rest of the bony framework. This remark applies especially to horizontal deviations, or, as it may be put, to a crumpled partition. An arched palate with deviation of the septum may be taken as an example of want of correlation in growth between various parts of the bony framework. In such a case a septum of normal growth and dimensions becomes deflected, because a previous deviation, associated with earlier ossifications of the palatal processes of the maxillary and palatal bones, has reduced the vertical diameter of the nasal fossæ. A deviated septum is frequently to be seen in mouth-breathers at about the age of puberty, in association with hypertrophies of the pharyngeal tonsil and narrow, highly-arched palates. I am not in a position to speak definitely as to the causal connection of these complicated cases. In such a circumstance the palatal defect may predispose to the glandular hypertrophy, or possibly the contrary sequence may be observed, and the glandular hypertrophy may hamper the palatal development.

Mayo Collier, arguing that deflections occur where the septum is thinnest and not where they are thickest, believes that in the blocking of one nostril from whatever cause, the air in it is rarefied by each inspiratory act, and if rarefied the walls of that nostril are subjected to a pressure exactly in proportion to the amount of rarefaction. . . . This combined and long-continued pressure at right angles to the nasal septum can hardly fail to push in the thin wall of the nasal fossa at its weakest point.

This contention is very plausible and possibly applicable to some cases, as, for instance, those of children, in whom a deflection of the soft cartilaginous—or an ill-developed bony—septum, whether or no the original cause be traumatism, is set right without direct surgical treatment, by the removal of associated adenoids or turbinal hypertrophy.

But it does not provide for those more common traumatic cases in adults, in which dislocation of the cartilage from the bony septum appears to have led to a corrective inflammatory process, affording a support to the weaker side, but resulting later in the development of a buttress-like hypertrophy to be presently described.

Deviations of the septum are often sigmoid in character, either in a horizontal, vertical, or oblique plane; further, the convexity of the deviation, especially when this presents at a line of suture between bone or cartilage, is frequently increased by the throwing out of a cartilaginous, bony, or, more commonly, osteo-cartilaginous buttress or spur. Such spurs are usually present when a deflected septum gives rise to obstructive symptoms. Spurs do not necessarily arise opposite lines of suture, but such is generally the case. In my experience the commonest form needing operative interference is what Holbrook Curtis calls an *oblique ascending* deviation and thickening, which passes along the suture of the upper border of the vomer with the triangular cartilage, and with the perpendicular plate of the ethmoid (see Fig. XXXVII., page 57). A *horizontal* spurred deviation is also frequent at the suture of the maxillary crest with the cartilage and with the lower border of the vomer. The form usually met with is a spur at the anterior part of the nostrils, composed chiefly of cartilage, which projects into and often closes the vestibule. *Vertical* spurs are the rarest form, and are associated with deflections showing a sigmoid curve in the horizontal plane from before backwards. It is to be noted that spurs, as distinguished from simple deviations, and especially when bilateral, represent in all probability exaggerated Jacobsonian plates, or palatine crests.

Deflections, while causing stenosis of the meatus into which they protrude, obviously increase the patency of the opposite—concave—side; but increase of function is apt to render the turbinated bodies on this open side liable to compensatory hypertrophy. This secondary overgrowth or vascular turgescence may take place to such an extent, that so high a grade of stenosis will be produced as to demand treatment; but it often happens that a deviated septum having been rectified, the correlative hypertrophy of the turbinals of the opposite side will spontaneously undergo partial and sufficient contraction.

Fracture may result in dislocation along the upper or lower border of the vomer; displacement is the most usual, and is generally restricted to the anterior part. Fracture, however, greenstick or otherwise, with or without dislocation, may occur anywhere. The triangular cartilage is, of course, the part ordinarily displaced, and when this happens there is always internal, and often, though not universally, external deformity also. My own experience enables me to entirely concur with those writers who believe that **traumatism is the most important factor in the production of septal deviations,** especially in the adult; and

any difference of opinion on this point may be at least partially explained by the circumstance that so many years often elapse between the injury and the development of symptoms which demand relief, that the primary cause is often forgotten, and will only be elicited on cross-examination. My case-book teems with records of such examples.

MORBID ANATOMY.—As already remarked in the chapter on Normal Anatomy (p. 67), spurs of the nasal septum may originate in pre-existing structures, as, for instance, in the supra-vomerine cartilages; and cartilaginous spurs in the osseous region of the septum must either belong to this structure or be of new chondral formation. If in the normal cartilaginous region, spurs may be due either to simple cartilaginous hyperplasia or to an enlarged Jacobsonian plate, of which notice has already been taken; or, when bony, they may arise in the horizontal sub-vomerine plates of Potiquet,—apparently portions of the maxilla. Should spurs be composed of soft tissue, they are to be taken as simply localised hypertrophies of the normal elements of the nasal mucous membrane. In the event of one of this variety being found near the lower level of the middle turbinal, it is clearly an exaggerated or persistent tubercle, which rarely extends so far forwards as the cartilaginous area.

As a rule, all or any of the elements of the mucous membrane are present. A spur is therefore purely homologous in its nature. Occasionally, however, spurs removed from the bony region may contain hyaline cartilage as isolated nodules.

Soft or false spurs consist either of simple lymphoid cells, masses of acino-tubular glands, or localised patches of cavernous vascular tissue, similar to the erectile element of the inferior turbinal; but when occurring in other situations, and if marked by periosteal thickening, they must be considered as probably due to some inflammatory process, as might occur in rickets, traumatism, etc.

Little need be said as to the **microscopical** details, since every variety of tissue, normal to the region, may be represented in a greater or less degree.

Fig. CCCLXI. illustrates an ordinary example taken from the bony area. It will be seen to consist superficially of the usual ciliated palisade epithelium resting upon a hyaline basement membrane, and, lower, of a somewhat thickened fibro-vascular layer, which, containing acino-tubular glands, is seen more deeply to blend with the periosteum.

In endeavouring to differentiate between the traumatic and

developmental origin of septal errors, it will be useful to remember that the former are generally represented by a lateral and vertical (cartilaginous) displacement, whilst the latter are with few exceptions horizontal in direction and involve the osseous septum.

SYMPTOMS: **Objective.**—External deformities, such as depression of the bridge and lateral deviations of the tip, are rarely marked except after violent injuries. Internal deformity is rendered evident on anterior and posterior rhinoscopic examination, and often on external and internal digital exploration. Sometimes the full extent of the deviation only becomes evident after the reduction of erection of the soft tissues by means of cocaine, or of hypertrophy and growths by the cautery, snare, and other appropriate measures, or by the removal of an anterior spur. The position and consistence, as tested by probing and touch, render the diagnosis easy from both abscess and hæmatoma.

FIG. CCCLXI.—SEPTAL SPUR (½ *in Obj.*).

Cases of deafness, tinnitus, and even of labyrinthine vertigo, not infrequently come under notice, in which it is exceedingly difficult to pass a Eustachian catheter on account of septal deviation, and many ingenious modifications of this instrument have been devised for overcoming the obstruction; but the sequential relation has not yet received general recognition as indicative of a condition calling for surgical interference. Were such the case, it would often be found that rectification of the septum not only enables an ordinary catheter to be passed with ease, but in the majority of cases renders its further use unnecessary; in other words, the deafness and other aural symptoms are cured or greatly alleviated so soon as free nasal respiration is re-established.

While there is a general agreement amongst rhinologists and otologists as to the desirability of reducing all *soft* obstructions to free ventilation of the nostrils, very strong opposition has been manifested by some of them against removal of those that are *hard*. This appears to me unreasonable, for, while thickening of mucous membrane may be diminished by various means short of surgical operation, the impediment due to osseous and osteo-cartilaginous outgrowths is constant. Although somewhat

anticipating the section on treatment, it appears appropriate to here record one striking example of the benefit to the hearing from adoption of the principles I have indicated. The experience could be amply increased.

CASE CLXXXIV.—Mr. A. T. P., æt. 57, engaged as an orchestral conductor, consulted me in October 1893, on account of such extreme deafness that he had been obliged to resign his baton. He could only hear shouting conversation, and the watch on firm contact on the left side only. He complained also of giddiness, and that in conducting his band all the instruments seemed out of tune.

He was the subject of a very large 'spur,' growing from the septum of the left nostril; the right nostril being obstructed with hypertrophy of the tissues covering the turbinals.

After removal of the spur, his hearing improved to such an extent that he felt justified in resuming his occupation, which he pursued two years later.

Associated with nasal stenosis due to septal deviation, as also in that which may arise from hypertrophic rhinitis, the pharynx and upper part of the larynx are unduly congested. Wherever the narrowing is considerable, paresis of the soft palate, elongation of the uvula, varix of the root of the tongue and hypertrophy of the lingual tonsil, with the attendant symptoms of impairment of voice, and of faucial and pharyngeal tenesmus, will also be noted.

Holbrook Curtis (1890) has impressed upon the profession the causal relationship of *anæmia* and nasal stenosis, a circumstance that I have often noticed, and the importance of which I have frequently insisted on in practice. It is to be first observed that subjects of nasal obstruction, whether the cause thereof be cartilaginous deflection and spurs, intra-nasal polypi, or naso-pharyngeal hypertrophies, are always anæmic. The actual deficiency of oxy-hæmoglobin in such subjects may be demonstrated by means of Hénocque's hæmatoscope,—nowadays superseded by the hæmoglobinometer;—and Curtis has reported twenty cases in which the deficiency before operation was proved by means of this instrument to be reduced from the normal of 14 per cent. to as low as 5.5, and in one case to 3.5 per cent. After relief of the stenosis, improvement took place to the extent of a regain of oxy-hæmoglobin, in some instances of even double the former amount. Spirometrical experiments and other measurements show corresponding deficiencies and improvements in the vital capacity, chest-girth, and weight. These facts are of supreme importance, as to the possibility of this anæmia due to nasal stenosis being a predisponent of pulmonary trouble. *Cardiac depression* may also be explained on a similar hypothesis.

The **Subjective** symptoms are those of unilateral or bilateral, partial or complete, nasal obstruction, and are, as previously mentioned, frequently complicated by chronic and hypertrophic

catarrh, and polypi; also by hay asthma and other reflex phenomena, the last being especially noticeable when the spur actually touches and irritates either the middle or inferior turbinals. The functions of taste, smell, hearing, and voice-production are impaired. Headache and aprosexia, and any or many of the near and remote symptoms of nasal stenosis mentioned in the chapter on General Etiology, may be present.

TREATMENT.—When the deviation is due to a *recent injury*, and is of the nature of a dislocation or fracture, much may be done to correct it by the use of splints (Fig. CCCLXII.). In cases of long standing, Adams's operation of refracturing the septum and supporting it in position by such an instrument is rarely productive of brilliant results as regards removal of the deformity for which it is indicated, and to which it should be restricted. But although I do not advocate so severe a procedure for external deformity alone, it is to be noted that such a case is seldom uncomplicated by defects of function in the shape of anosmia, deafness, faulty voice-production, etc.

FIG. CCCLXII.—ADAMS'S SEPTUM SPLINT.

These can be effectually relieved by removal of the obstructing part of the septum by means of a nasal saw (Bosworth or Goodwillie), or by a circular trephine, driven by a surgical engine or electro-motor. I know of no innovation in modern rhinological practice for the relief of (hard) nasal obtructions to which I am so much indebted as to nasal trephines. Spurs of large size can be reduced at one sitting with little pain, under cocaine. Any projections requiring further treatment may be removed with a small saw. The hæmorrhage is sometimes considerable, but rarely alarming, and I have always been able to check it by either douching with hot water, or by closely plugging the nostril with cotton-wool pledgets, soaked in a 15 or 20 per cent. solution of hazeline or antipyrin. Some practitioners dilate the nasal passage at the same time as the obstruction is removed, either with bougies or tubes, but these are seldom used by me for the first fourteen days. Nasal splints for correcting a sigmoid deflection of the cartilaginous septum in the adult are, in my experience, rather disappointing, and are liable to set up painful inflammation. But in young children I have seen good results with such instruments. Since I commenced to operate by trephine and saw, I have given up treatment by cautery, incisions, or punches.

Bosworth claims to have only once perforated a septum in sawing operations, the number of which would appear in his practice to amount to thousands. Indeed, he made that statement several years ago, and repeats it with all his increased experience in his later published *magnum opus*. I can hardly believe that, dwelling so strongly as he does on the importance, in correction of a deformed septum, of achieving a perfectly smooth surface, that failure to entirely eradicate a spur would explain such a unique immunity to perforations. It is the personal opinion of many, that not only is it often impossible to remove a spur, whether by trephine or saw, without perforating the partition, but that such a procedure is in some instances of sigmoid flexures the only means to bring about the restoration of a breath-way in both nostrils. Looking, moreover, to the comparative frequency of non-dyscrasic septal perforations, unassociated with caries or necrosis, and their slight liability in such circumstances to cause deformity,—a point correctly insisted on by Bosworth himself,—one hardly sees why a perforation should be so much dreaded.

The following cases, which could be multiplied ten or even twenty fold, and are taken almost haphazard from the notes of my private practice, are briefly narrated for several reasons :—

1. As examples of the most ordinarily witnessed varieties of deviations.
2. As indicating the nature of the symptoms usually present.
3. As illustrations of the frequency of traumatism as an etiological factor of deformity of the septum.
4. Of the length of time that often elapses between the accident and the resultant inconvenience.
5. To exemplify various methods of treatment.
6. And, lastly, by pictorial illustration to give some idea of the appearances presented to view on anterior rhinoscopic examination.

With regard to these drawings, it may be thought that because I have objected to anterior nasal diagrams for general use, on the ground that it is impossible, on any one conventional plan, to represent a full perspective of the receding nasal fossæ, these drawings are contradictory of that position ; but, in point of fact, my sketches aim only at giving a general and somewhat composite delineation of deflections of the nasal fossæ as looked at from the several points of view necessary for complete examination, this necessitating visual inspection, not only from the right and left of the middle line, but also in the separate axes of the superior, middle, and inferior choanæ.

It is important to note that many of these drawings were made from cocainised patients, and therefore for the most part represent actually *less* stenosis than really existed.

CASE CLXXXV. (FIG. CCCLXIII.).—That of a medical friend practising in Lancashire, who consulted me in 1887. The drawing represents a very large septal spur, almost completely obliterating the lumen of the inferior meatus, which is still further obstructed by hypertrophy of the inferior turbinated body. A small spur at the site of junction of the maxillary crest with the triangular cartilage is seen on the right side. The following is the patient's history in his own words: 'When 14 years old (I am now 46) I was kicked on the left side of the nose by an unshod ass; the immediate result was "two lovely black eyes," and a swollen nose; and it was soon afterwards noticed that my nose had altered its shape; but I felt little or no inconvenience till I was 26, when I found my nostrils stuffed up. I was said to have polypus, and an attempt was made to remove something with forceps. I suffered much pain, lost a bucketful of blood, but of course derived no benefit. Until I saw you I was still under the impression that I had polypus.

FIG. CCCLXIII.

'The *symptoms* are mainly those of discomfort when walking quickly, which occasions me to keep my mouth open, and makes me liable to get sore throat in very cold or dry weather. I have great irritation in the nostrils and back of the throat. Whilst in America, at the meeting of the Congress, the usually dry character of the air produced an irritation which was distinctly painful. I am not only liable to head colds, but I think I have them more severely than any of my patients; my greatest discomfort, however, is at night, when after a short time the nostril of the side upon which I lie becomes so obstructed as to occasion change of attitude, and when I turn over I am obliged to breathe through the mouth for some time before nasal respiration is restored. Restless nights are therefore very frequent. Sitting up, or on my back, I can generally breathe with my mouth closed. The *aural* trouble came on very gradually,—in fact I was fairly deaf before I noticed it; there is, as you know, indrawing of the drumhead of both ears, due, I suppose, to unequal air-pressure.'

CASE CLXXXVI.—Dr. J. J. T., æt. 35, practising in Wales, consulted me on account of extreme inconvenience arising from mouth-breathing, especially when rowing, running, or riding; he stated that twenty years previously he had had a blow on the nose from football on two separate occasions, first on one side and then on the other. He had had a severe fall on the face when he was six years of age. The drawing illustrates a double spur at the suture of the septum and the maxilliary crest. The patient suffered also from varix of the veins at the base of the tongue, and stated that he always arose in the morning with some blood in the mouth, evidently from this situation.

FIG. CCCLXIV.

CASE CLXXXVII.—Mrs. C. N., æt. 34, from Edinburgh, consulted me in October 1888, on account of increasing tendency to nasal catarrh, dry throat in the morning, fatigue of voice after singing or reading, paroxysmal cough, headache, and restless nights. I found the right inferior meatus blocked by a large spur, with general hypertrophy of the mucous membrane of this side; paresis of the soft palate and lingual varix were also present, and the mucous membrane of the larynx was congested and inclined to be thickened. The spur was *sawn* off, as indicated by the dotted line in the diagram, and the other condtions treated at a later date by the galvano-cautery, sprays, etc., all with the most satisfactory result.

FIG. CCCLXV.

CASE CLXXXVIII.—Master T., æt. 11½, from Gloucestershire, recommended to consult me by Dr. Sampson of Painswick, on account of mouth-breathing. His father was the subject of hypertrophic rhinitis, slight middle-ear deafness, and a tendency to asthma. The history of the child was, that five years previously he had fallen from a wall, violent hæmorrhage occurred, and the nose was much swollen afterwards. On examination, I found a sigmoid deviation and thickening of the septum, as indicated in the figure, together with adenoid vegetations in the naso-pharynx.

FIG. CCCLXVI.

These latter having been removed, the deviation, which was quite soft, was rectified by forcible straightening, the wearing of *Grant's splints* for several hours a day, and the plugging with medicated lint in the intervals. By these measures not only was natural breathing re-established, but a deformity which had threatened to become serious was corrected.

CASE CLXXXIX. is that of a lady, æt. 75, recommended to consult me by Dr. Bezley Thorne. Although the spurs delineated in the figure were the undoubted cause of considerable nasal distress and reflex respiratory irritation, having regard to her advanced age, I counselled only *palliative* treatment, in the shape of iodol ointment and menthol inhalations.

FIG. CCCLXVII.

CASE CXC.—Mr. J., æt. 29, a solicitor, consulted me on the recommendation of Mr. Greig-Smith of Bristol. He complained of deafness and tinnitus, weakness of voice, and especially fatigue on reading aloud long documents, dryness of mouth in the morning, and other symptoms of nasal stenosis. The drawing (Fig. CCCLXVIII.) represents an unusual amount of thickening and deviation of the septum, as well as polypoid hypertrophy of the turbinated mucosa.

FIG. CCCLXVIII.

CASE CXCI.—T. R. B., Commander R.N., æt. 36, came under my care in May 1887, on account of failure in resonance of voice and great hoarseness, and fatigue on the least exertion, so that it was almost impossible for him to give the word of command in tones that could be heard, and this to an extent that constituted a serious impediment to his professional career.

He also complained of constant dryness of the throat. Although he admitted that traumatism was probable, he could not remember any definite occasion on which he had received a blow on the nose. I found, in addition to a sigmoid flexion of the septum, a very considerable prominence amounting to a definite spur on the left side, and varix at the base of the tongue. The spur I *sawed* off, and the varicose vessels were cauterized at a later date. The result of the treatment is best given in a letter received from the patient, July 22nd of the same year: 'I have not had the slightest trouble with my throat since I last saw you; my voice is getting much stronger, my nose is well, and I feel sure that when you next see me you will be quite satisfied that the operation has been in every way a success.' This gentleman went through the manœuvres of 1888. After which experience he wrote: 'I am only now beginning to realise the amount of good you have done me. In spite of the filthy weather we have been having, and the lot of shouting I have had to go through, my throat has not given me the slightest bit of trouble, and my voice seems to be getting

FIG. CCCLXIX.

stronger and better every day.' He again served in the manœuvres of 1889, without any relapse, and two or three years later expressed himself as feeling his throat stronger and better than it ever was before.

CASE CXCII.—Mr. W. M. J., æt. 40, a publican from Liverpool, sought advice in September 1889, for the relief of post-nasal catarrh, which had existed for twelve years. He remembered to have had a violent blow on the nose from a cricket-ball at the age of fifteen. The figure (CCCLXX.) shows a thickened deviation of the septum, evidently the result of fracture, producing complete stenosis of the left choanæ. Stenosis on the right side was also present, the result largely of compensatory hypertrophy. The obstruction in this case was completely cured and the symptoms relieved by means of *forcible nasal dilatation with Hewetson's instrument, followed by splints and bougies.*

FIG. CCCLXX.

CASE CXCIII.—Rev. J. G., æt. 35, seven years in holy orders, consulted me on account of his voice continually failing him. Although not previously aware of it, he was utterly unable to breathe through the left nostril, and on being questioned remembered that he had had a severe blow on the left side of the nose nine years previously, when playing at football at Cambridge. Fig. CCCLXXI. shows a unilateral ascending deviation of the septum along the suture of the triangular cartilage, and the vomer completely blocking the left nostril, and on the right side there is a small spur at the junction of the triangular cartilage with the maxillary crest. Treatment consisted in *trephining* on both the right and left sides, as indicated in the figure; the operation on the left side was completed by means of the *saw*. The result was satisfactory above all expectation.

FIG. CCCLXXI.

CASE CXCIV.—Major T., æt. 48, retired from active service and superintending a Government department, consulted me on June 4th, 1888, on account of failure of voice, disturbed sleep through mouth-breathing, dry throat, fulness of head after a very short period of official occupation; in fact, of *aprosexia* in a marked degree. I found a spur on the right side, and a great general thickening of the septum on the left, the cause of which condition was attributed to having had his face trodden on when playing football nearly twenty years previously; there was, however, no external disfiguration. The *spur on the right side was sawn away*, and the *thickening on the left cauterised.* On November 1st, 1888, he wrote: 'Since you took me in hand, I have been enjoying an amount of comfort such as I had not known for years, and shall ever feel sincerely grateful to you for it.'

FIG. CCCLXXII.

CASE CXCV.—The Rev. W. S., an Irish priest, æt. 51, and a powerful man, measuring six feet five inches in height, and weighing 271 pounds, was seen by my friend Mr. Jakins, in my absence in June 1887, on account of failure of voice, which had existed eighteen months, with irritation and dryness of the throat. His breathing power was considerably impaired. His symptoms were explained by a relaxed condition of his soft palate, which was probably secondary to almost absolute obstruction of his left nostril, due to a somewhat bi-lobed septal ecchondroma. Traumatism, though highly probable on account of certain personal proclivities, was not inquired into. Relief by palliatives to the fauces was such that radical treatment was not adopted.

FIG. CCCLXXIII.

CASE CXCVI.—Major P., æt. 38, consulted me in June 1887, on account of general nasal discomfort and disturbed sleep, from which he had markedly suffered for two or three years; though on inquiry it was found that nasal respiration had never been entirely free since he struck his nose by running against a wire fence on a dark night in the year 1874. On examination, I found a large spur entirely obstructing the inferior breathway of the left nostril, and a bi-lobed cartilaginous thickening on the right aspect of the septum.

The *left* nostril was treated by *trephine and saw*, the *right* by *saw alone*, as indicated by the dotted lines in the figure.

He made an excellent recovery, and was entirely relieved of all his distress.

FIG. CCCLXXIV.

CASE CXCVII.—Mr. F. H., æt. 39, retired officer from the army, consulted me with symptoms very similar to the last patient, and at about the same period of the year.

There was complete obstruction of the left nostril by reason of an antero-posterior sigmoid deviation of a highly thickened septum, and of the inferior meatus of the right by a distinct spur.

On inquiry, it was found that he had had a very severe fall on his face when skating on the ice twenty years ago, so much so that he had considerably injured his teeth, and although his nose was much swollen at the time, he was unaware that it had been permanently injured until his recent discomfort had brought the past to his memory.

FIG. CCCLXXV.

This case was also treated by *trephine on the right side*, and *trephine and saw on the left*, with the result that the normal breathway was completely re-established, with corresponding disappearance of his distressing symptoms.

CASE CXCVIII.—J. M., clerk, æt. 31, consulted me at Easter 1887, on account of hay-fever, paroxysmal sneezing, and chronic post-nasal catarrh. There was no history of any previous injury.

He was the subject of chronic hypertrophic rhinitis, and an irregular-spurred deformity of the septum, partly bony and partly cartilaginous, and more pronounced on the left than on the right side. At the floor of the right inferior meatus was a small osteoma arising from the palatal process of the maxilla, to the importance of which I have drawn attention. Having rectified the *left* deviation of the septum by the *saw*, and *trephined* the small *exostosis on the right side*, *cautery* was, at a later period, applied to the middle and inferior turbinals, with the result that all the symptoms of hay-fever were quite relieved, and he passed the following summer with complete immunity from his former symptoms.

FIG. CCCLXXVI.

CASE CXCIX. is that of a lady of title, æt. about 26, who, inheriting a disposition to middle-ear catarrh, consulted me in the autumn of 1887, on account of increasing deafness and tinnitus, with muffled voice, dry mouth on waking, and other symptoms of impaired nasal respiration. On examination, there was found to be a sigmoid-shaped deviation of the septum, which was greatly thickened, and entirely obstructed the middle meatus, and partially the inferior of the left side, and the entire inferior meatus of the right side.

I operated on the *left nostril by trephine and saw*, in November 1887, assisted by Mr. Jakins, and Mr. Braine administering chloroform. The only after-disturbance was rather severe neuralgia; but the recovery was good, and improvement on that side so complete that in the spring of the following year I was asked to operate on the *right*

FIG. CCCLXXVII.

nostril. This I did also by *trephine and saw*, with the result that on December 3, 1889, I received a letter from her mother, saying that she had 'waited a little while to observe if the improvement in her daughter's hearing sustained itself, and was happy to report that it had done so, and had been remarked upon by several of her relations while visiting them.' This case was known also to Sir Oscar Clayton.

This lady has since married, and continues to hold the improvement I was able to afford her.

CASE CC.—Mr. H., æt. 26, an officer in the Royal Engineers, consulted me in March 1888 on account of headache, aprosexia of severe grade, dry throat, and other evidences of nasal obstruction. Hearing was unimpaired, but an almost constant tinnitus was complained of. The condition was attributed to an injury to the nose when at school.

FIG. CCCLXXVIII.

Anterior rhinoscopic examination revealed the presence of double-spurred condition of the septum at the junction of the maxillary crest and cartilage. The middle and inferior turbinated bodies were hypertrophied and in contact with the septum, the whole causing very marked stenosis.

Under the influence of cocaine the *left spur was removed by the trephine, the right with a saw.* Quoting his own words:—

'Before the operation I had no pain in my nose, but I could not breathe through the left nostril at all, it being blocked up by a hard growth of some sort. My breathing through the other nostril was only partially impaired by the same cause.

'I was hardly at all exhausted after the operation,—in fact, I felt quite well until about two or three days afterwards, when I got a little headache, owing chiefly to lying in bed and being indoors, I think. The operation itself was exceedingly unpleasant, but after it was over the pain I suffered was very slight; but of course the discomfort from the plugs which were inserted was very great.

'My operation was done on Monday. On Thursday, I think, I came down to dinner, and went out on Saturday, but did not consider myself fit to do as usual, *i.e.* take any violent exercise, for about a fortnight more. I can now breathe equally well through both nostrils, and am exceedingly glad I had the operation done. I also used to have headaches, and a dry throat on awaking in the morning, both of which have now gone.'

CASE CCI.—General T., æt. 53, retired from the Royal Engineers, came to me in May 1888, very shortly after the patient whose case was last given; and indeed the letter quoted was in response to inquiries of this gentleman. The history was that there had been a serious fall, leading to a broken nose, with permanent external disfigurement, and that for many years nasal respiration had been almost impossible, so that sleep had been most disturbed, and discomfort constant. This case is interesting as being one of the few I have seen with manifest external deformity corresponding to the intra-nasal mischief, which consisted in this instance of a general thickening of the septum, much greater on the left than right side, the deviation being evidently the result of traumatic fracture.

FIG. CCCLXXIX.

The patient was operated upon, under an anæsthetic administered by Mr. Braine, by *trephine and saw*, as indicated in the figure. Relief was immediate; but the patient had to leave England for Canada before he was really well, and I did not see him again until the summer of 1889, when I found that there had been some inflammatory thickening, leading to some relapse of the symptoms. I destroyed the hypertrophic tissue by cautery, and afterwards enjoined the introduction of nasal bougies with iodol. Under this treatment the nasal breathway was completely and permanently re-established.

CASE CCII.—Mr. G. B., æt. 43, consulted me in July 1889, on account of snoring disturbed sleep, and fulness of the head. I found a very congested pharynx, and, on examination of the nasal fossæ, a very considerable hypertrophy of the erectile tissue covering the septum, which was, however, somewhat reduced, especially on the right side, by application of cocaine. The patient was of gouty habit and a free liver. For this condition he was treated for some days, and I then applied the *galvano-cautery* to the situation of the overgrowth on two successive occasions, a week intervening between each. He was further treated with *iodol ointment*, and recommended to employ a menthol inhaler. Under these measures the hypertrophy was reduced, and the symptoms almost entirely removed.

FIG. CCCLXXX.

CASE CCIII.—Dr. R., æt. 60, consulted me in 1887, on account of constant irritation in the throat, bronchitis every winter, and general disposition to 'asthma,' without any actual attack of that nature.

On examination, I not only found chronic congestion of the pharyngeal and laryngeal mucous membrane, but, on anterior rhinoscopy, observed that he was the subject of an enormously thickened and deformed septum, the deviation having originally been of a sigmoid character. So distorted were the parts, that there was some trouble in recognising the respective turbinals, and for the sake of elucidation they are indicated by letters in the illustration. With the probe was felt the condition described by Woakes as 'cleavage' of the middle turbinal, and the absence of importance in a clinical sense of this phenomenon was very clearly made out.

FIG. CCCLXXXI.

This gentleman derived considerable relief from treatment of his pharyngeal condition by astringents, and the soft tissues of the nares were reduced by means of menthol, snuffs, and inhalations, and by iodol ointment. I had also prescribed chloride of ammonium and iodide of sodium. I did not advise operative treatment.

CASE CCIV.—Mr. M. G. C., æt. 18, was seen by me on June 18, 1888, suffering from toneless voice, headache, deafness in the left ear, and, during the last month or two, from tinnitus. On questions asked, it was elicited that he had injured his nose by a fall from his pony when between four and five years of age. There was no external deformity. Anterior rhinoscopy showed a sigmoid flexure of the septum, with a large enchondroma blocking the left nostril anteriorly. This was treated by saw and trephine, and the deviation further rectified by the wearing of one of Grant's splints when the parts had healed. Politzer inflation was also employed to improve the hearing, and in the end an entirely successful result was obtained.

FIG. CCCLXXXII.

The **after-treatment** of all cases, irrespective of the exact kind of operation, used to consist in plugging with absorbent wool, medicated for the first twenty-four hours with a strong solution of pyoktanin, after-insufflations of aristol, iodol, or sozoiodol for the first week, and later an iodol ointment twice a day by means of a brush, or a solution of menthol and iodol dissolved in olive oil, to be employed as a spray. For some long period I have, however, ceased to employ any form of plug, unless for the

arrest of hæmorrhage, and have kept the passage unobstructed from the first.

Douches should not be employed, unless there is hæmorrhage, for the first forty-eight hours, and then at low pressure. My syringe (Fig. CVIII., p. 162), which contains only two ounces, and has several points of exit, so as to form a kind of coarse spray, is both unobjectionable and effective. I generally employ a solution of the alkaline powder (Form. 80) or Dobell's solution by means of a coarse spray; chinosol, or some form of antiseptic alkaline tabloid, such as Seiler's, are more recent additions to the remedies of this class. The mucous membrane, where removed, is speedily regenerated, and the wound heals usually within fourteen days. It is of the utmost importance to forewarn a patient that he must be prepared to give up so much time for rest at home and careful surgical nursing; for, while it is difficult to over-estimate the amount of improvement to be gained by removal of septal obstruction in suitable cases, nothing is more likely to bring the operation into disrepute than an under-estimation of the mischief which might occur from want of care during convalescence.

Dislocation of the Columnar Cartilage.—This is a somewhat peculiar deformity, first described, I believe, by Bosworth, in the following words:—'We find, lying immediately below the cartilage of the septum, and parallel with its lower border, a small oblong plate of cartilage, not usually mentioned in our text-books of anatomy, the purpose of which seems to be to act as a support for the integument of the column.' This has been designated as the columnar cartilage, but is more likely to be an exaggeration of the Jacobsonian. Bosworth does not enter into the question of etiology, though he suggests that in one of the two cases he relates, 'the cause of the affection was the pressure of the thumb in using the handkerchief.' I have myself often seen cases since my attention was drawn to the subject. The following are examples:—

Case CCV.—A young lady, about 25, in whom the deformity was attributed to severe and long-continued paroxysmal sneezing, but there was also pretty constant coryza, so that Bosworth's explanation might have applied in this case.

Cases CCVI. and CCVII. were those of a boy, æt. 15, and his sister, æt. 13, brought to me by Dr. Forbes of Eastwood. The first had suffered two severe injuries playing football at a public school; the young lady had been in the habit of descending the staircases by the balusters instead of by the steps, and on one occasion had fallen on the nose. Whether these injuries were causal is open to doubt, since the father had a similar deformity. In both children there was considerable obstruction to nasal breathing from a hypertrophied pharyngeal tonsil, removal of which constituted part of the treatment.

Treatment is that advised by Bosworth, and has been very successful in my hands. It consists in dissecting out the cartilage through a small incision made over it, resecting the redundant portion of mucous membrane, and uniting the edges with fine sutures.

Synostosis or **synechia** is a term I apply to a bony or cartilaginous bridge, which one occasionally sees extending from the bony septum to either the middle or inferior turbinal, as a product of non-traumatic inflammation, and sometimes as an untoward result of cauterization or other intra-nasal operations, in which directions for further dilatation by means of bougies or hollow nasal tubes have been neglected.

FIG. CCCLXXXIII.

CASE CCVIII. — The accompanying illustration (Fig. CCCLXXXIII.), typical of this condition, was taken from a female patient, æt. 24, under my hospital care in May 1898. The symptoms were those of nasal obstruction, but no history was to be obtained of any former injury, operation, or illness, which could have accounted for the bony bridge that extended across the *right* nostril. On the *left* side there was no bridge, but a small sharp spur, between which and the opposite turbinal there was seen, whenever an examination was made, a connecting link in the shape of a thread of glutinous mucus.

When these adhesions cause obstruction, their removal by saw, trephine, etc., followed by careful dilatation, is the treatment obviously indicated; but a successful result is often difficult to obtain, on account of the strong tendency to re-union.

III. *NEW GROWTHS, WHETHER OF MUCOUS MEMBRANE, BONE, OR CARTILAGE.*

BENIGN GROWTHS.

Nasal polypi.—The word polypus is derived from the fancied resemblance to a zoöphite, and the appearance in the nostril has been compared to that of an oyster; also, on account of its translucency, to the pulp of a grape.

These growths are of two kinds, **myxomata** and **fibromata**; for the sake of convenience, other benign growths of the nares will be included in this section. Pure fibromata are, however, rare, and moreover present symptoms and considerations for treatment of an entirely different character from what is understood by the term polypus. This word, in its clinical application, should be restricted to innocent mucous pedunculated growths.

According to Zuckerkandl, in nearly half the cases examined by him *post-mortem*, the growths sprang from the mucous membrane bounding the hiatus semilunaris; and it is probable that in more than four-fifths of the cases they arise from, or near to, the middle turbinated body and bulla ethmoidalis. They are not infrequently present in the accessory cavities. Although reported to be rare on the superior turbinated body and roof, I almost weekly remove small growths which apparently arise above the middle turbinal, and therefore presumably from one of these upper sites. It is doubtful if true polypi ever arise from the (anterior) septum. In the few cases in which septal growths have been reported in this situation, they were probably, as in one observed by myself, of a warty (papillomatous) nature. The miscalled lymphoma or polypus of the posterior or pharyngeal end of the septum is really an evidence of outlying adenoids, and such examples are common in my experience.

Growths of the inferior turbinated body rarely have slender peduncles; they have been already alluded to as moriform polypoid excrescences, under the head of Hypertrophic Rhinitis, which they often complicate. They are seldom seen in conjunction with ordinary polypi; and, when occurring on the anterior half of the turbinal, they must not be considered as polypi, but as mucous warts, or as papillary myxomata. When they arise from the posterior extremity they are rather of the nature of angiomata, and represent various degrees of the condition already described as **turbinal varix.**

Although polypi usually commence in one nostril, their presence in both is the rule in well-established cases. This fact will, however, be only demonstrated on visual examination. Or perhaps the patient may complain only of unilateral obstruction in the first instance, and will not be conscious of disease in the opposite nostril until that in the first has been removed. Notwithstanding that polyps when developed to moderate size, are always more or less pedunculated, they most likely, as already pointed out, arise as sessile œdematous swellings at dependent situations (see Fig. CCCLXXXIV.). I believe that this lymphatic œdema is usually the result of chronic catarrh, often hypertrophic in character, and in some instances complicated by obstructive septal spurs and deflections. Bosworth happily describes the mucous covering of the middle turbinal area in this condition as becoming 'water-soaked,' and teaches that subsequent pyriform growth is accounted for by anterior stenosis and suction action in hawking, sniffing, and nose-blowing efforts, while, as I have

already remarked, pedunculation may be due simply to the force of gravity. Strangely enough, however, this author doubts the hygroscopic properties of polypi, but the fact is amply confirmed by daily clinical experience.

Morell Mackenzie hesitates to accept catarrh as an important etiological factor, on the ground that whereas polypi are rare before puberty, catarrh is common enough in early years. It must be remembered, however, that though profuse muco-purulent catarrh is common in children, true hypertrophic rhinitis and septal deviations, both of which lead to thickening of the epithelial and other layers and to diminished watery secretion, are decidedly rare in early life, and this is indeed logically conclusive, since not till puberty are the turbinals fully developed. Nasal polypi are more frequent in the male sex, and may occur at almost any age. I have operated on patients as young as seven, and on one as old as eighty; and the majority of my patients have been over thirty years of age.

HISTO-PATHOLOGY.—Polypi of the nose, histologically as well as clinically, form two distinct groups—(1) Those whose origin is associated with, and is doubtless dependent upon, some local inflammatory granulation changes; (2) that variety which apparently arises independently of any local disease marked by the formation of granulation tissue.

Those of the first group are as a rule associated with suppurative disease of the ethmoid labyrinth, and are formed from granulation tissue whose matrix undergoes rapid increase, absorbs water from the surrounding moisture, and soon assumes the typical translucent appearance. If examined under a high power, there will be very little fibrillation found, but simply connective-tissue cells, varying in size and shape, embedded in a homogeneous clear or cloudy matrix, which encloses blood vessels whose walls are only composed of one or two layers of epithelioid plates. The matrix consists almost entirely of mucin, a fact which contra-indicates the use of any reagent containing acetic or other acids in the preparation of the specimen.

The surface may be covered with ciliated or flattened cells, according to the duration and exposure of the growth.

Scattered irregularly throughout the matrix are hyaloid bodies, varying in size from $\frac{1}{1000}$ in. to $\frac{1}{800}$ in., similar to those already described as occurring in chronic inflammatory processes in other regions.

The second group of polypi differ entirely in structure and nature. A glance at Fig. (CCCLXXXIV.), representing a section

taken from the anterior extremity of a somewhat prominent middle turbinal, shows marked mucoid transformation of the normal elements, with abundance of thin-walled blood vessels, and conversion of the columnar ciliated cells into stratified. This last change is doubtless the result of irritation. The drawing well demonstrated the transition from a thickened membrane to a definite polypus. The section further illustrates a condition generally termed *œdematous infiltration*; but Wingrave has proved by chemical analysis of the tissue, together with special staining by the pyro-molybdate method, that the greater portion of the matrix yields mucin, and that the growth is not of the nature of a simple œdema. The attenuated walls of the blood vessels and a mechanical facility afforded by its position, combined with the natural hygroscopic character of the mucin, all favour a gradual increase in bulk and the assumption of a pendulous and pedunculated form.

FIG. CCCLXXXIV.—MUCOID TRANSFORMATION ($\frac{1}{2}$ *in. Obj.*).

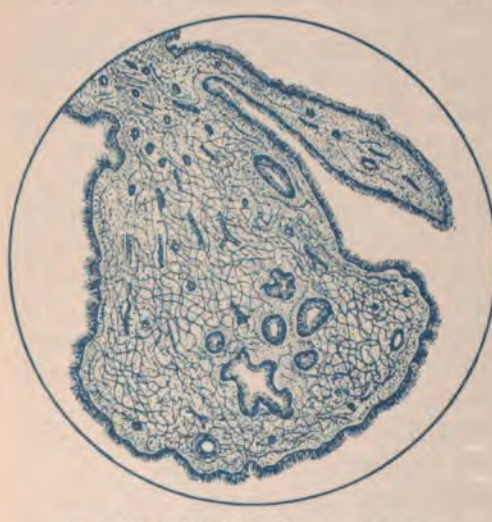


FIG. CCCLXXXV.—MUCOUS POLYPUS ($\frac{1}{2}$ *in. Obj.*).

Fig. CCCLXXXV. depicts the structure of a simple polypus under a low power. It will be observed that the epithelium, not having been exposed to friction, is of the usual palisade variety. The bulk of the tumour

consists of a delicately arranged network, whose meshes, distended by a mucin-holding matrix, frequently entangle connective-tissue corpuscles of various sizes and shapes.

There are also seen some irregularly-shaped crypts lined with ciliated epithelium, similar to that of the surface. These are due to invaginations of the surface cells, and may become the seat of cysts, a condition often specialised as *cystic polypi.*

Examination with a higher power demonstrates (Fig. CCCLXXXVI.) that the reticulum consists of white connective-tissue fibres and fine capillary blood vessels, which, as already remarked in the general anatomy (p. 70), have an intimate connection with the basement hyaloid membrane, and also with the more deeply situated and distended veins.

This histological dissection of the framework of a polypus is doubtless the outcome of the mucoid changes which involve the matrix, but not the fibres, which are gelatinous in nature. It is further to be remarked, that the reticulated character of this form of polypus constitutes an important point of distinction between it and that variety which originates in granulation tissue.

FIG. CCCLXXXVI.—NASAL POLYPUS (⅛ *in. Obj.*).

A more dense form of polypus, which to the naked eye is more flesh-like in appearance, differs from the purely mucoid only in the presence of an excess of connective-tissue corpuscles ; the matrix being relatively scanty, while the blood vessels are even more numerous. This sarcous character is generally seen in connection with irritation, as when the polypus protrudes behind the soft palate, and in recurrent formations. Fig. CCCLXXXVII. illustrates the macroscopic appearance.

SYMPTOMS.—The prominent symptom of polypus is partial or complete **nasal stenosis,** according as the obstruction is confined to the middle meatus or invades the inferior also. These symptoms are generally, but not always, bilateral. Stenosis will also be controlled by the amount of accompanying alar collapse, turbinal hypertrophy, and septal deformity ; it will vary according to the amount of moisture in the atmosphere, and in a measure to change in the position of the growths. Stuffiness is sometimes

accompanied by the feeling of a moving body in the nose. Sneezing is, in my experience, non-constant, and indeed infrequent, though Bosworth holds that it is *par excellence the* symptom of polypus. The phenomenon, when present, cannot be due to any acuteness of sensation on the part of the polypus, but must be ascribed to hyperæsthesia of the 'sensitive areas' of the mucosa proper.

Excessive secretion from the rest of the mucous membrane, due to the action of the polypus as a foreign body, is often marked. A purulent discharge is strongly suggestive of partial obstruction of the orifices of the accessory cavities, and when mal-

FIG. CCCLXXXVII.—MUCOUS POLYPUS OF THE NOSE.—This drawing of a polypus, taken intact from the left nostril of a young lady, æt. 24, by means of a wire loop passed from behind the soft palate, fairly well indicates the firmer myxo-fibromatous character of the growth, with ulcerations of the posterior portions (P) presenting at the back of the pharynx behind the soft palate, and the friably mucous form (A) of that which had lain comparatively quiescent in the choanæ, and was visible by anterior rhinoscopy.

odorous is pathognomonic of a sinusitis. In such cases complaint is made of a feeling of localized distension. Epiphora ensues when the nasal duct is pressed on or obstructed, either in its course or at its inferior aperture. Mucous polypi never cause marked displacement of bones, though the bridge of the nose often appears widened, and pressure on the veins causes œdema at the root of the nose, with fulness of the vessels of the orbit.

Voltolini was one of the first to connect asthma and other **reflex neuroses** with the presence of nasal polypi. Headache and aprosexia are frequent. Any or all of the functions of smell, taste, hearing, voice-production, and even sight, may be impaired,

the rationale of which results have been already explained when treating of the general etiology. Pharyngitis, laryngitis, and bronchitis, with emphysema, often constitute later complications of fully established mouth-breathing. The peculiar toneless, muffled voice and thick articulation are so characteristic as to give the lead to recognition of the trouble on the first words of the patient.

DIAGNOSIS is easy on account of the position, colour, shape, insensibility, and mobility of the growths, as tested by inspection and probing. Fibromata are hard, sessile, and readily bleed. Mucous polypi cannot, with care, be mistaken for mere turbinal hypertrophy, or such rare growths as osteomata and enchondromata, or for a spur, abscess, or hæmatoma of the septum. It would be a serious blunder to diagnose a polypus for a meningocele.

PROGNOSIS.—The result of treatment as regards the relief of all symptoms of obstruction, including the impairment of the special senses, is nearly always favourable. Hearing is generally improved, and further impairment prevented.

Asthma, in association with nasal polypi, is in a large number of cases absolutely cured by removal of the growths; but such a fortunate result cannot always be promised, and I know of no method which will enable one to give a differential prognostication on this head. Presumably those cases in which a reflex asthma had longest existed would be those in which failure might be anticipated, on account of the long-standing cause, but I could quote as many cases in opposition to this *a priori* deduction as in its support.

There is no danger to life except in those rare instances in which the polypus undergoes sarcomatous or carcinomatous changes, a possibility which is to be borne in mind.

Such an event has been stated to be the result of repeated operation for recurrence, but I have never had or seen a case in which the evidence was at all conclusive of such a hypothesis. The inference that it would be more probable to follow on crude and rough attempts at evulsion is certainly not without the justification of experience. The tendency, however, is for all these growths to become more and more fibrous each time they reappear, constituting the myxo-fibroma of some authors. This subject is further considered presently.

Regarding **recurrence,** I am careful to insist on the importance of immediate attention on the part of the patient to the slightest reappearance of symptoms, and on the removal of any

new growth, however small, so soon as discovered. It is only by such co-operation of attention and perseverance on the part of surgeon and patient that hope of a radical cure can be promised with any degree of certainty.

TREATMENT.—No doubt powders of alum or tannin temporarily reduce the size of a polypus, and somewhat relieve nasal obstruction by depriving the growth of some of the fluid element, but such treatment has no other than a temporarily derivative action. Caustic powders used as snuffs are, to say the least, dangerous. Caustic pastes or solutions, applied *secundum artem* to the base of a polypus when it can be clearly made out under proper rhinoscopic illumination, might be fairly safe in the hands of experts, who, however, usually select other means; but such measures are but too often blindly attempted by those unskilled in intranasal manipulations, with, it may be, the result of great ulcerative destruction of the olfactory and respiratory mucous membrane, coupled with injurious irritation of the growth itself. For this purpose, chloride of iron, bichromate of potash, chloride of zinc, nitrate of silver, chromic and carbolic acids, have been from time to time recommended; but such methods are to be unhesitatingly condemned.

Much discussion has taken place over the time-honoured method of evulsion by forceps, introduced by the hand unguided by the eye, by which much harm has over and over again been done to the turbinated bodies, the ethmoid bone, septum, accessory sinuses, and nasal duct. With a proper rhinoscopic examination and competent manipulation, such culpable accidents never occur. The growth is grasped as near as possible to the base, and forcibly torn or twisted from its attachments. By this method it sometimes happens that a portion of the ethmoid bone is removed along with the growth. While I agree with Bosworth in his dissent from Morell Mackenzie's statement that such removal 'is not only justifiable, but oftentimes demanded,' I do not consider that the circumstance is to be regarded as an accident of import, and all the less because it is sometimes unavoidable.

Provided good illumination is employed, and the eye guides the instrument, it is immaterial whether snares (Figs. CXXXI. and CXXXII.) or forceps (Figs. CXXXIII. and CXXXIV., p. 179) be introduced. For the most part, I employ the cold wire snare, with forceps as an occasional adjuvant.

Some years ago I made a long-continued trial of the galvano-cautery snare-loop for removal of nasal polypi; but I came to the conclusion that the platinum wire required for this purpose

was far less adaptable than the steel wire of the cold snare; also it was necessary to employ special hooks for securing the growth while the loop was adjusted (Fig. CXXX., p. 178). It is true that steel loops are now used for cautery instead of platinum, but as they lose their temper and rigidity after once being heated to redness, the instrument has to be re-charged for each separate introduction,—an altogether needless waste of time and trouble,—since the vaunted superiority in regard to diminished pain, and especially diminished hæmorrhage, of the cautery over the cold steel loop is not borne out by experience.

Morell Mackenzie lauds the ordinary galvano-caustic terminal shaped as a knife so as to cut through the pedicles. Such a method should be used with great caution in the upper meatus, even by an expert.

Prior to all operations at removal, cocaine (10 per cent.), eucaine (5 per cent.), or a combination of the two, should be employed, as recommended in the section on Anæsthetics at page 184.

Hæmorrhage, although free at the time of operation with snare or forceps, is but seldom alarming, and decreases in proportion as the eradication is complete. It can generally be stopped by application of antipyrin, in 10 to 20 per cent. solutions, on cotton-wool, or by a hot-water douche. Secondary bleeding is apt to occur on reaction from the temporary constriction occasioned by cocaine. I have found that by dissolving the cocaine, or substituted anæsthetic of that genus, in tincture of hammamelis, the liability to this accident is greatly diminished. I have also observed that in those cases in which after-bleeding occurs to such an extent as to necessitate posterior plugging of the nostrils, the ulcerative changes which almost invariably follow greatly reduce the chances of recurrence of the growth.

The main point for the cure of polypus consists not so much in the removal of the growth,—nor, indeed, in the all-important complete eradication of the minutest visible polypus,—as in the destruction of the soil and the bases of their origin, and in the cure of the catarrh, which, while an almost constant first cause, is also very frequently an obstinate sequel. So long as this catarrh exists, the fear of recurrence must always be present; and it is here that the value of the galvano-cautery is manifested as pre-eminent above all other forms of local treatment. It is my custom, long after every sign of polypus has been removed, to make weekly, or less frequent searings of limited and indicated portions of the mucous membrane with the cautery-point,

until the secreting surface is so changed that the flux becomes arrested.

Other assistant measures, as the use of vaseline ointments or sprays medicated with iodol, menthol, or eucalyptol; constitutional medicines, such as arsenic, belladonna, and phosphorus, Turkish baths, the waters of Aix-les-Bains, Challes, and Mont Dore; of mountain air, sea-voyages, and the like, are all of advantage in confirming a cure. I have largely ceased to employ douches at any stage of a nasal disease occurring in the subject of polypus.

Polypoid excrescences and **hypertrophies** of the posterior surfaces of the inferior turbinated body may be removed by Hamilton's instrument (Fig. CXXXII., p. 179), or a somewhat similar one known as Jarvis's; or by the 'spoke-shave' of Carmalt Jones, who attained very brilliant results from its employment.

Fibromata

While pure fibromata are rare, mixed growths, in which the fibroid elements preponderate, are fairly common; they are of the same typical structure as those occurring in the uterus and elsewhere, and are said to originate from the nerve-sheaths. They differ from mucous polypi histologically, in the scantiness of the matrix; clinically, in their deep red colour, want of translucency, in a firmer consistence to the probe, in the absence of peduncle—for they are usually sessile—and in their often lobulated and irregular appearance. These points will be evident on combined anterior and posterior rhinoscopic examination. Their presence is associated with frequent and often grave epistaxis, and there is generally a profuse discharge of muco-pus. In addition to nasal stenosis, with the usual accompanying symptoms of obstruction, they sooner or later lead to the external deformity of the nose known as 'frog-face,' due to expansion of nasal bones; they exhibit the most unrelenting progress in their growth, causing absorption of bone and other tissues, and encroaching on the pharynx, antrum, orbit, and cranial cavity. If untreated, they destroy life by means of this extension and from repeated hæmorrhage. On the other hand, apart from doing harm by pressure, they are not malignant in the true sense.

Treatment.—If recognised at an early stage, a permanent cure may be effected by means of the snare or galvano-cautery, operating through the ordinary channels; but when once the growth has attained sufficient size to encroach on neighbouring

areas, some such more formidable external operation as Rouge's or Ollier's, at the hands of the general operating surgeon, will be necessary. For details of external nasal operations, the student is referred to works on general surgery.

The **prognosis** is usually favourable, epistaxis before and hæmorrhage after operation being the most dangerous complication.

CYSTOMATA

Cystic growths are only rarely met with in the nasal choanæ. When pendent they look exactly like mucous polypi, but they may also project from the floor of the nostril. Their true nature is often shown by their collapsing when examined digitally, as is the case of those growing from the posterior extremities of the turbinals, or on seizure by forceps or snare. Occasionally, as already mentioned, Mucous polypi undergo cystic degeneration. Even after free evacuation of their colourless and limpid, or—it may be—of a slightly reddish viscid fluid, cysts are apt to refill; and although, when they spring from the anterior extremity of the inferior turbinated body, simple incision may effect a cure, galvano-cautery is often necessary to ensure against recurrence.

I append notes of two cases of this nature:—

CASE CCIX. occurred to me in 1872 in the person of a lady, æt. 36, who had long suffered from nasal discomfort, the cause for which had apparently not been discovered. Indeed, her nostrils had never been examined. Observing a glistening body in the upper part of the right middle meatus, I applied a snare, in the belief that it was a polypus. In tightening the loop, the growth collapsed, a rush of clear fluid came from the nostril, and only a shred of membrane representing the capsule of the cyst was withdrawn by the instrument. I applied galvano-cautery to the site of attachment, and the patient was effectually and permanently cured.

CASE CCX. is that of a young lady of half-caste African birth, æt. about 25, who suffered from obstruction of the left nostril, on account of a soft cystic growth attached to the posterior part of the corresponding turbinated body. Frequent operations with the snare resulted in detaching shreds of membrane, and the release of some glairy fluid; but recurrence continually took place. I therefore later treated with the galvano-cautery, with the effect of giving permanent relief.

PAPILLOMATA

Warty growths, exhibiting under the microscope typical papillary structure, are occasionally seen springing from the septum or inferior turbinated bodies in young persons about the age of puberty. They sometimes grow from the lining of the vestibule. According to Hopmann, 20 per cent. of cases roughly diagnosed as polypi are really of a papillomatous nature, but this is doubtful,

for such frequency of occurrence has not been observed in th practice of others.

FIG. CCCLXXXVIII.—WARTY OR SQUAMOUS PAPILLOMA (*2 in. Obj.*).

Histo-pathology.—Papillomata of the nos may be divided int two groups—(1) Thos occurring in the vesti bule, and (2) thos growing from th mucous membran proper. The first variet is exhibited simply as cutaneous wart, eithe sessile or pedunculated and all the character peculiar to that struc ture are presente (Figs. CCCLXXXVIII CCCLXXXIX., an CCCXC. But th second group merits a special description. This neoplasm i really a papillary myxoma, since its matrix or core consists fo the most part of myxo matous or polypoi tissue, arranged in fimbriated manner an covered with columna ciliated epithelium.

FIG. CCCLXXXIX.—SQUAMOUS PAPILLOMA (⅔ *in. Obj.*).

Fig. CCCXC well illustrates th arrangement. At th base of the tumou there will be seen some irregularly shaped vascular spaces, which doubtless communicate directly or indirectly with the capillaries extending into the fimbriæ. This growth must therefore be considered simply as a local hypertrophy of the normal mucous membrane and not of inflammatory origin, and is, in fact, an

exaggeration of the normal corrugations. A papillary myxoma may grow from the inferior turbinal or from the septum, rarely from the middle or superior turbinals; if attached to the upper structures, it eventually becomes a polypus by simple gravitation.

These warts, whichsoever the variety, are easily snared, and the bases may be destroyed by chemical or galvanic cautery.

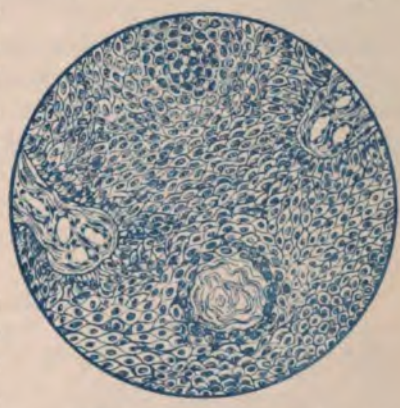


FIG. CCCXC.—SQUAMOUS PAPILLOMA NESTS OR PEARLS (⅛ *in. Obj.*).

ENCHONDROMATA

It is convenient to restrict this term to all cartilaginous tumours springing from any part of the nasal cavities or accessory cavities, *other than the septum*, since enchondroses of the triangular cartilage have been already fully discussed as septal cartilaginous spurs. The latter cause stenosis of the choanæ, but do not displace the bony framework of the nose by excessive growth, which, on the other hand, is often characteristic of enchondromata.

FIG. CCCXCI.—PAPILLARY MYXOMA (½ *in. Obj.*).

The growths under consideration are frequently the occasion of considerable nasal deformity, and may even lead to osseous absorption, and, by pressure, cause destruction in the orbit or cranium. In addition, they may give rise to any or all of the symptoms of nasal obstruction. They not unfrequently assume a malignant chondro-sarcomatous character. If detected early, they can be removed with the nasal drill or trephine, worked by a surgical engine or electro-motor. When so large as to cause deformity or

pressure on neighbouring parts, an external operation will be necessary.

Osteomata,

or bony tumours, are of rare occurrence in the nose. They are said to spring from the periosteum or perichondrium, or some portion of the fossæ, or from one or other of the accessory cavities. They are usually pedunculated, and, in addition to more or less evident symptoms of obstruction, they give rise to headache, epistaxis, and a muco-purulent discharge. They can be removed, when accessible, by forceps or saw.

Le Bec has reported the case of a patient, æt. 23 years, who was the subject of an eburnated osteoma, which affected the vision. The tumour, which was the size of a hen's egg, was successfully removed with the gouge and mallet.

Exostoses,

or outgrowths of the bony framework, have been already alluded to in the section on deviations and spurs of the bony septum; in addition, I occasionally meet with them anteriorly in the inferior meatus, as pedunculated or as pyramidal growths springing from the maxillary crest, or from the floor of the nasal fossæ, where they cause anterior stenosis. In this situation they may be the unrecognised cause of a stenosis, or may constitute the reason for an incomplete relief in cases in which septal deviations have been corrected. They can be easily and safely removed by the nasal saw, drill, or trephine.

Malignant Growths.

Sarcomata sometimes originate in the nasal fossæ, or may invade them from adjacent structures. The septum and the nasal wall of the maxillary antrum are apparently the commonest sites, though I can call to mind cases in which sarcomatous growths have been removed by me from the superior meatus under the impression that they were innocent, until rapid recurrence led to a microscopical examination.

Nasal sarcomata may be of the round, fusiform, myeloid, and alveolar varieties.

Illustrations of the first two have already been given when treating of these growths in the pharynx and larynx (pp. 366, 374, and 675), and need not be again repeated; the other two,

the first report, but four others revealed all the characteristics of a round and spindle-cell sarcoma, in which the matrix was in excess of the cells.

Epitheliomatous transformation of mucous polypi is of far more rare occurrence. The only one I have been able to find is recorded by A. Barker in the 42nd volume of the *Pathological Transactions* (1891).

Mr. Barker's patient was a lady, æt. 40, who had undergone previous operative treatment before she came under his care. The first portion removed by him, which had the appearance of an ordinary polypus, was attended with great hæmorrhage, as were also further partial removals effected by her family attendant; the patient died eight months after the first operation.

The Morbid Growths Committee of the Society reported the growth to be of the nature of *carcinoma myxomatodes cylindroma* of Ziegler.

The same surgeon mentions one other case of a somewhat similar character, in which the disease extended through the ethmoid to the brain. To these I can add a third.

FIG. CCCXCIV. — EPITHELIOMATOUS TRANSFORMATION OF NASAL POLYPUS (1 *in. Obj.*).

CASE CCXIII.—The patient was a man in middle life, whose clinical history presented no special features of interest, except that he had long been the subject of recurrent nasal polypi. It will be seen from the histological report of Mr. Wingrave, that in this instance the conversion was not of the nature of a cylindroma, but that of a stratified or squamous epithelioma.

The larger drawing (Fig. CCCXCIV.) represents a complete section of the removed growth. In addition to the ordinary characters of a polypus, which are well marked, several patches of deeply stained tissue may be seen, which consist of islands of squamous epithelium. Under a higher power (Fig. CCCXCV.), a section taken from the upper and left-hand portion of the growth, as depicted in the larger drawing, the surface ciliated epithelium which covered the greater part of the polypus is seen in process of transition to the stratified squamous variety, which in turn is invading the subjacent tissue to form isolated patches. In the neighbourhood of this island-forming invasion is an abundance of well-defined small-cell tissue.

IV. *EPISTAXIS, OR RHINORRHAGIA.*

Sir Thomas Watson has quaintly but pertinently observed that nose-bleeding is sometimes a remedy, sometimes a warning, sometimes really a disease in itself.

Etiology.—The first division of causes is naturally that of (1) local and (2) constitutional. Of the local are those which follow on traumatism—operations, blows, and a habit of nose-picking. Next comes the hæmorrhage connected with new formations and ulcerations—innocent and malignant.

1. **Local** Epistaxis, in connection with operations on the nose, is rarely alarming, and is usually arrested by pledgets of cotton-wool, saturated with a 5 or 10 per cent. solution of antipyrin or tincture of hammamelis, packed into the nostril. The same mild prognosis may be given of hæmorrhage resulting from violence, excepting only fracture of the base of the skull, associated with rupture of a venous sinus, or of the internal carotid artery. Hæmorrhage from fibromata and malignant growths is almost invariably associated with ulceration. Bleeding from the nasal cavities, uncomplicated by evident rhinal disease, is, in my experience, nearly always from a spot at the anterior part of the septum where the artery of the septum joins with the ascending branch of the descending palatine artery near the anterior palatine canal. Spurs are very frequent at this spot, which, from their growth, tend to attenuate the mucous membrane; moreover, foreign bodies are apt to accumulate and help on the formation of an adherent incrustation, and these crusts, when suddenly removed by picking, violent blowing of the nose, or by sneezing, leave a breach of continuity of the epithelial covering of the spur.

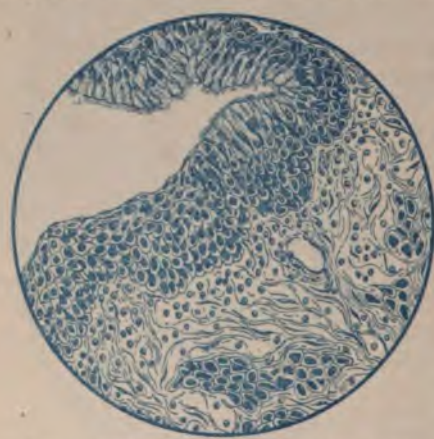


FIG. CCCXCV. — EPITHELIOMATOUS TRANSFORMATION OF NASAL POLYPUS (⅛ *in. Obj.*).

Of epistaxis of local origin an interesting example is related by Jackson Clarke in the forty-third volume of the *Pathological Transactions*.

CASE CCXIV.—It was that of a boy whose death was directly due to hæmorrhage following fracture of the base of the skull. The specimen exhibited considerable distension of the sphenoidal sinus, with laminated blood-clot, which was evidently derived from an aneurysm of the internal carotid. Whether this aneurysm was prior or sequential to the injury was doubtful.

Of nose-bleeding due to local causes there will often be found some supplementary constitutional factor. Hæmorrhage is not uncommon in the ulcerative processes of syphilis, lupus, leprosy, and other dyscrasiæ. In leprosy it is almost invariable, and constitutes, indeed, the earliest premonitory symptom of the disease in the respiratory passages.

2. As regards other **constitutional** factors tending to epistaxis, with or without erosions of the mucous membrane, the influence of the generative function can be first considered, because it represents the slightest departure from the normal. I have already pointed out the connection between sexual irritation and turgescence of the turbinated corpora cavernosa, and it is not surprising that nose-bleeding is frequent about puberty, is often the sequel of masturbation, and is occasionally a form of vicarious menstruation. Of blood conditions predisposing to epistaxis, I need do no more here than enumerate the chief, viz. hæmophilia, purpura, scurvy, anæmia, leukæmia, plethora; eruptive and relapsing fevers; acute yellow atrophy and phosphorus poisoning. A diseased and weak state of the vessels may exist in old age, in atheromatous conditions generally, in syphilis, phthisis, and alcoholism. Increased blood-pressure may be a factor of epistaxis in diseases of the heart, liver, lungs, and kidney, associated with obstructions to the circulation, and in such circumstances is often a warning of impending apoplexy. In my own practice I have more than once been puzzled to account for the source of a nose-bleeding, until the urine has been tested, and revealed the presence of albumen; and I have seen three or four cases in which it was associated with the conditions of chronic bronchitis, emphysema, and dilated right heart.

Treatment.—As already mentioned, after nasal operations the bleeding can usually be checked by digital compression, or by packing the nostrils with pledgets of cotton-wool; should this fail, the pledgets may be soaked in a solution of antipyrin (five per cent.), or of hazeline. Whether the epistaxis is or is not traumatic in origin, the bleeding spot should be always sought for, and mechanical or digital pressure applied, if possible, over it. Applications of ice-cold water to the interior and exterior of the nose constitute a very favourite remedy, in the belief that they act by causing constriction of the small vessels. According to general experience, however, especially in connection with hæmorrhage in the naso-pharynx, a douche of hot water is often more valuable; for it clears away all imperfectly formed clots, and thus favours the firmer coagulation of the oozing blood.

Strong astringent douches often produce anosmia and other damage; nevertheless 'styptic colloid' on cotton-wool pledgets is useful when the hæmorrhage is from the anterior part of the septum. When there is ulceration, and the bleeding point can be ascertained, slight chemical or galvano-cauterisation may serve not only to arrest the bleeding, but also to promote cicatrisation. Sedative and stimulating ointments assist the healing process, and prevent further incrustations.

If all these measures fail, the posterior nares must be plugged by means of Bellocq's apparatus. The procedure is so fully described in surgical manuals that it need not be here detailed.

Coupled with all local means, the application of heat to the lower extremities, with draughts or enemata of warm solutions of Glauber's salts, will assist in the reduction of blood pressure.

As **prophylaxis,** constitutional treatment appropriate to the predisposing condition of the patient must be also adopted, and any errors of living, diet, hygiene, etc., be corrected.

V. *NEUROSIS.*

Anosmia, or Anosphresia.

When impaired olfaction depends on obliteration of the 'olfactory slit,' as in the case of a hypertrophied middle turbinated body touching the septum, or when a septum is so deflected as to touch the middle turbinal, the treatment is obvious, and nearly always satisfactory, unless the abeyance of the special sense is very marked, and of long standing. The same may be said of anosmia the result of polypi, in which cases the sense of smell usually returns after eradication of the neoplasms; in some instances, however, the pressure of growths on the delicate olfactory area permanently injures the mucous membrane and nerve-endings; this is especially so in fibromatous and sarcomatous growths which invade the sensory areas. Anterior stenosis from inferior turbinated hypertrophy, without obliteration of the middle passage and olfactory slit, causes only impaired smell, such as is witnessed in an ordinary nasal catarrh; moreover, on relieving the stenosis, the special sense generally returns. Alar collapse, a condition sometimes dependent on one or other of the foregoing, and sometimes primary, is also a not infrequent factor.

In atrophic, syphilitic, and caseous rhinitis, as well as in some long-standing forms of chronic hypertrophic rhinitis, the olfactory area is so involved by the morbid lesions that olfaction is greatly

and often permanently impaired. Schultze's sensitive cells may be over-stimulated and injured by tobacco smoke and irritating chemical fumes. Snuffs of tobacco, and nasal powders medicated with morphia, alum, or tannin, may also occasionally act prejudicially; and the same may occur as the result of over-douching of the nares.

Lesions of the olfactory bulbs and tracts—which may be congenitally absent—and of the intracranial centres, whether from traumatism, tumours, abscesses, hæmorrhages, or other morbid conditions, including those of the accessory cavities, often cause partial or permanent bilateral or unilateral anosmia.

Treatment.—In addition to the removal of any local cause, strychnine, arsenic, phosphide of zinc, valerian, and other nerve tonics may be administered. Sajous recommends one-fortieth of a grain of strychnine to two grains of powdered sugar to be used as a snuff, or to be insufflated into the olfactory areas night and morning. As regards electricity, both the constant and interrupted currents should be tried, the negative pole being placed at the root of the nose, and the positive at the occiput. Bosworth has advised moderate practice with different odorous substances, a change being made every few days. I have had but little opportunity of testing this method, which, however, could be conveniently used in connection with an olfactometer.

A word may be said on **functional** anosmia, which is usually unilateral, and is apparently due to a temporary inhibition, not explained by any yet recognised morbid source. In some cases it may be traced to influenza or some other cause for nervous prostration. The loss of this special is generally associated with hemianæsthesia of skin, of sight, of hearing, and sometimes of taste.

PAROSMIA.

This condition, which consists in perverted sensation,—illusions of smell,—is not due to lesion of the nasal mucosa, but occurs as an accidental symptom in cases of lead-poisoning, epilepsy, locomotor ataxy, intra-cranial disease, and other pathological and functional morbid conditions of the nervous system. The condition of parosmia, or, as Warden calls it, *paraphresia*, is often associated with disordered taste, which has been termed by the same author *parageusia*. These symptoms are often to be found in diseases of the accessory cavities, and especially of the maxillary.

VI. *FOREIGN BODIES.*

PHYSICAL.

Rhinoliths. — Independently of the ordinary foreign substances, such as hairpins, plum-stones, etc., which may be introduced into the nostrils by children, lunatics, and malingerers, there are occasionally found calcareous concretions, which are mostly the result of the deposit of phosphate of lime from the nasal secretions, around a piece of necrosed bone, blood-clot, or foreign nucleus. As the rhinolith increases in size, it gives rise to *subjective* symptoms of obstruction, anosmia, parosmia, nasal voice, and headache, with *objective* evidence in the shape of an accompanying profuse muco-purulent discharge. A nasal calculus appears black or yellowish on visual inspection, and gives a gritty sound on probing. Fœtor, if present, is only slight, unless there is concomitant necrosis. Such bodies can be generally removed by a curette, forceps, or snare. They are rarely so large as to require to be first crushed. If not readily seized from the front, Sajous' plan for removing any **foreign body from the nose** should be adopted. It consists of passing a wire, or long threaded bodkin or Bellocq snare, through the nose to the pharynx, attaching a lint tampon, and by *vis a tergo* drawing the foreign body to the anterior nares. These concretions being often embedded in granulation tissue, are sometimes overlooked or wrongly diagnosed as polypoid excrescences with dead bone.

BIOLOGICAL.

Larvæ, Fungi, and other animal and vegetable parasites are rarely met with in the nasal cavities in this country. A whiff of chloroform or a spray of alcohol is the best means for their destruction, followed by antiseptic and other measures calculated to restore the health of the mucous membrane.

CHAPTER XXX

DISEASES OF THE ACCESSORY CAVITIES OF THE NOSE

DISEASES of these air chambers received but scant notice in the clinical observations of the earlier throat specialist, notwithstanding that the indefatigable Luschka had, by accurate anatomical study, prepared the ground for practical research.

During the seven years (1866–1873) in which I was in daily association with the late Sir Morell Mackenzie, both in his private and hospital practice, I never saw a case diagnosed as due to disease of the maxillary antrum, or of any of the other accessory cavities, frontal, ethmoidal, or sphenoidal. In all probability, therefore, such maladies were practically unknown. It is true that dentists had occasionally recognised an empyema of the maxillary antrum as a disagreeable consequence of abscess at the root of the upper bicuspids, and first or second upper molars. Ophthalmic surgeons had also been aware of the fact that certain ocular and orbital symptoms were due to disease of one or other of the frontal cavities; but hardly an allusion was made to the subject in treatises on surgery, and what was said in respect to diagnosis was very misleading, each successive author from the time of John Hunter repeating the remark of his predecessor, that the classical signs of inflammation, 'heat, pain, redness, and swelling,' were the invariable witnesses of antral disease. This we now know to be fallacious. To Spencer Watson, who also practises as an ophthalmic surgeon, is due the credit of being the first English rhinologist to clearly expose the principles of diagnosis and treatment of chronic empyema of the antrum of Highmore. This was in 1875. In February 1879 I reported three cases to the Harveian Society, and it was at this date that my hospital colleagues joined with me in a closer watchfulness for diseases in this region. But it is only within the last ten or twelve years that recognition has been given to the fact that the whole pathology of diseases of the antrum is not

comprised in chronic empyema; nor that a decayed tooth is the sole cause of this particular condition.

It is only within this same short period that diseases of the other accessory cavities have been thoroughly and differentially studied.

Special Anatomy.

The general structure and relations of the several accessory cavities have been described (pp. 60–62) with more fulness than is generally accorded, but on account of the increasing importance now given by specialists to diseases in this region, still more detailed consideration of some anatomical features is demanded.

Fig. CCCXCVI.—Coronal Section, illustrating Asymmetry of Maxillary Antrum and Ethmoidal Labyrinth (after Zuckerkandl).

Development.—In the first instance these cavities are not, strictly speaking, sinuses, but rather expansions from the olfactory recesses or pits, budding laterally and posteriorly into the substance of the cartilaginous nasal capsule. An exception is found in the case of the frontal 'sinus,' which is developed at a much later period as an offshoot of the anterior ethmoidal cells, penetrating between the two layers of the frontal bone, and quite apart from the nasal capsule.

The order in which these sinuses appear is as follows:—

1. Maxillary, at the *fourth fœtal month.*

2. Ethmoidal, at the *seventh fœtal month.*
3. Sphenoidal, at the *third year of life.*
4. Frontal, at the *seventh year of life.*

The maxillary antrum is well defined at birth, but undergoes little change until the second dentition,—sixth to eighth year,—from which date it develops rapidly in common with the facial bones; but this development is often unequal. Thus, as is shown in the accompanying illustration (Fig. CCCXCVI.), the capacity of one cavity may be fully double that of another; but as this often depends on variations in the thickness of the bony walls (*a* and *b*), no external evidence of the asymmetry is afforded, and attempts to formulate the dimensions of an antrum by superficial landmarks are untrustworthy. The illustration also demonstrates the tendency to the formation of sulci or pockets, by thin bony projections, even in the antrum of Highmore, so often described as a single cavity.

FIG. CCCXCVII.—VERTICAL SECTION OF LINING MEMBRANE OF SPHENOIDAL SINUS ($\frac{1}{8}$ *in. Obj.*).

The same figure shows that this want of symmetry is also to be found in the ethmoidal cavities; and it is worthy of note that these inequalities of the accessory cavities are in the picture which illustrates them conspicuously unassociated with septal or turbinal deformity, which is so often ascribed as a cause.

Histology.—It has been already stated that the accessory cavities are 'lined by thin closely adherent mucous membrane continuous with that of the nose,' but amplification is essential to a full appreciation of the morbid processes: for the *lining membrane* varies in thickness from 13 μ in the sphenoidal sinus to 34 μ in the maxillary. In each cavity it is so closely adherent to the bone as to be inseparable from the periosteum, and is chiefly dependent on its osseous walls for its nutrition. Columnar ciliated and chalice epithelium is the covering common to all the sinuses (Fig. CCCXCVII.); it is supported not by a basal hyaloid membrane as in the nose, but by a stroma which

is composed of white and elastic connective tissue fibres entangling fixed and wandering cells. These elements are, as we have seen, intimately blended with the periosteum, and are traversed by blood vessels, few in number and arranged in wide capillary meshes.

In strong contrast with the nasal mucous membrane, is the almost entire absence of glands in these cavities. There are, however, a few of the simple tubular variety disposed horizontally in the stroma (Figs. CCCXCVIII. and CCCXCIX.). They are lined with short cubical epithelial cells, and are probably albuminous in nature. Nor are the lymphatics so highly differentiated as in the nose, no lymphoid tissue being seen; but lymph

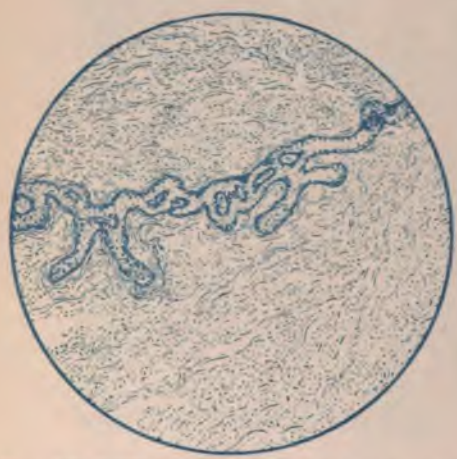


FIG. CCCXCVIII.—TUBULAR GLANDS OF THE SPHENOIDAL SINUS (*2 in. Obj.*).

FIG. CCCXCIX.—TUBULAR GLANDS OF THE SPHENOIDAL SINUS (*⅓ in. Obj.*).

spaces with lymph vessels are freely distributed, and are believed to readily communicate with the sub-arachnoid cavity.

These characters are general to all the sinuses, except the maxillary, which presents on its inner wall, especially near to the ostium, a considerable thickening of the mucous membrane, liberally studded with glands, transitional in form from the compound acino-tubular of the nose to the simple tubular type just described (Fig. CCCC.). This anatomical feature readily explains the selection of this area as a special site for cyst-formation.

It is interesting to note that in the lower animals, the rabbit for example, these glands open by a single conduit close to the ostium. In man, this arrangement by which outflow through

the ostium is favoured, exists to a certain extent in relation to the ethmoidal cells. But, as a rule, exit of the secretion from the accessory cavities generally is dependent (1) on movements of the cilia; (2) where there are supernumerary ostia, on compression of the air, as in blowing the nose; (3) possibly on variations in posture of the individual; and (4) on evaporation; for neither in the maxillary nor in the sphenoidal sinus is the point of exit situated at the most dependent part of the cavity.

Physiology.—In the first place, the purpose of these cavities has long been accepted as that of lessening the weight of the facial bones; but although obviously **air**-chambers, their ventilating arrangement—when there is but a single and narrow aperture—must be held to be imperfect. Still this is in itself sufficient, so long as the natural opening remains patent, since interchange of gases is readily maintained by diffusion.

In Zuckerkandl's Atlas, there are several illustrations of supernumerary apertures in the maxillary sinus; it is stated that they have been found in the proportion of 25 per cent., but from the minuteness of most of them their significance may be easily exaggerated.

FIG. CCCC.—MUCOUS MEMBRANE OF INNER WALL OF MAXILLARY ANTRUM (AFTER ZUCKERKANDL).

The scarcity of glands in the three minor sinuses is suggestive of scanty **secretion,** and this leads us to appropriately object to the commonly employed term 'mucous' as applied to the lining membrane of these cavities; nor does it appear quite reasonable to assume the normal existence of an abundant 'mucous' flow from a ciliated membrane in which glands are so few. This objection does not apply to the maxillary sinus.

Regional variations.—As a further preliminary to the study of inflammations in these cavities, it is expedient to indicate certain structural features of clinical bearing which are peculiar to each sinus.

Maxillary.—1. For purely anatomical reasons, an exceptional origin of disease in the maxillary antrum is dental caries.

4. Its free communication with the sub-arachnoid lymph space.

5. Unlike the other sinuses, its ventilation and drainage aperture is situated at its most dependent point.

6. Absence of direct communication with the nasal fossæ, the infundibular cells of the ethmoid being intermediary.

Sphenoidal.—1. Its relative isolation.

2. Its relative inaccessibility.

3. The relative rarity of its implication.

4. The asymmetrical subdivision of the right and left cavities, a feature it shares with the frontal.

[By a typographical error the reverse of this is conveyed in the anatomical description in Chapter III., page 62.]

5. The high position of the ostium.

6. Its intimate relation to the cavernous sinus and to the nerves passing to the orbit.

For the reason of all these anatomical and regional distinctions, it is well nigh impossible to treat of morbid conditions of the accessory cavities as a whole, and separate clinical consideration is required for each. It must not, however, be forgotten that extension of an inflammation from one cavity to another is by no means so infrequent as has generally been taught in this country. Indeed, all the cavities may be simultaneously involved. This is all the more likely to occur in the case of an acute inflammation. I shall therefore treat this portion of the subject on broad and general lines, reserving chronic and other lesions for separate and distinctive discussion.

Acute Sinusitis.

With the surrender of the position that a carious tooth is the universal and sole factor of a maxillary empyema, acceptance should have been promptly given to the circumstance that the majority of chronic cases must be preceded by an acute stage. It must be admitted, however, that to Continental pathologists is due the insistence of this fact.

But, indeed, it is not even yet acknowledged by specialists in this country, for we find that the author of an article on this subject to the latest System of Medicine, commences with the remark that, 'practically speaking, we may disregard in this place all affections of the accessory cavities other than suppuration'; and he straightway proceeds to consider its chronic form, dismissing in a single line the possibility of its

ever originating as acute, or as a direct result of 'catching cold.'

Acute sinusitis is **frequent**, though the statement may be questioned by those whose practical observation has not been drawn to the fact, or whose knowledge of the disease is derived solely from British literature. A few statistics should dispel any doubts in that direction.

Gradenigo has published two series of figures in 1891 and 1894, which demonstrate that, as a result of post-mortem examination of the maxillary antrum of 203 patients taken without selection as to the cause of death, chronic empyema was found in 45 instances, otherwise in over 22 per cent.; or as Lermoyez, quoting these figures, puts it, *one at least of every five hospital patients taken at hazard is the subject of a chronic sinusitis.* It will be observed that these statistics not only exclude acute inflammations, but they are confined to only one of the accessory cavities; however, we now know that similar implication of the frontal, ethmoidal, and sphenoidal sinuses is by no means rare.

Another proof of the want of recognition of acute sinusitis in general practice is given by E. Fränkel of Hamburg, who, desirous of making some bacteriological researches on the contents of the cavities, performed autopsies on 146 patients who had died in his hospital, and were found to be the subjects of sinusitis. In not a single instance had this condition been recognised during life.

And yet again, Weichselbaum of Vienna, who (1886) was the first to describe bacteria in antral contents,—he had found them in the walls in 1881,—ascertained by autopsy of all the accessory cavities of a large number of patients dead of influenza, that inflammation of one or other antra existed in 90 per cent. of the subjects examined. So startling are these figures, that if they came from a pathologist less eminent, one might be tempted to hope that the relation of *post* and *propter* had been confused. However, with every allowance for demographic and hygienic differences, it is thus forced upon us in England, (1) that acute sinusitis in relation to only one infectious fever is exceedingly common, and (2) that chronic sinusitis of all the cavities is frequently passed unheeded in its acute stage. It is some consolation to know that in a large proportion the trouble undergoes spontaneous cure or remains latent.

Etiology is both extended and complicated. First in frequency is an **acute endo-rhinitis.** This need not be of a definitely specific nature, for although several micro-organisms

of varying degrees of pathogenicity have been discovered in the contents and discharges of the accessory cavities, there are none that may not be found in every acute nasal catarrh, and hardly any that are not present in an average specimen of nasal secretion. Nevertheless it is undoubted that when the rhinitis is associated with, or, it may be, when it is consequent on, some acute infectious fever, the chances of extension of the inflammatory process to an accessory cavity is greatly enhanced. We have seen how frequent is its association with **influenza**, and to this malady may be added, as bearing causal relation, **scarlet fever, typhoid, smallpox,** and **measles.**

Acute sinusitis has also been mentioned as a complication of **pneumonia,** but it is more probable that a pneumonia, as also a *laryngitis* or *tracheo-bronchitis*, is in such circumstances a consequence and not a cause of the nasal and nasal-accessory inflammation. It is, in fact, an example of 'a head cold descending to the chest,' which is recognised by popular tradition as an omen of gravity. Another reason for believing that the sequence of events is as I suggest, is that the rhinal discharge is the first to disappear, and that relief of the laryngeal, tracheo-bronchial, and pulmonary symptoms promptly follow suit, and in the order named. The pulmonary trouble may be produced in three ways—(1) by simple continuity of surface; (2) by surface chill of the body in the depressed condition, characteristic of an acute nasal catarrh, wherein the patient is liable to somewhat profuse perspiration of the head and trunk; and (3) if a bacterial origin be advanced as essential, by simple conveyance of bacteria through the air-passages, and the setting up of infective foci in the lower respiratory tract and tissues.

E. Fränkel is, however, strongly of opinion that the pulmonary mischief is primary, and he even speaks of a pneumonic form of antral disease due to the *diplococcus lanceolatus*, which he has found very frequently not only in the maxillary antrum, but in the frontal and ethmoidal cavities. The same observer found Pfeiffer's bacillus once out of thirty cases in which the sinusitis was due to influenza.

Case CCXV.—Mr. St. George Reid obtained a nearly pure culture of this last-named organism in a case of ethmoidal sinusitis recently under my care, in conjunction with Dr. Arnott of Brixton. Nasal discharge had appeared fourteen months previously after a 'severe cold.'

It may be here mentioned that of other bacteria in this situation, the *streptococcus* has often been found in pure culture; also *staphylococcus*, but this always in association with other

of the natural openings of the accessory air cavities,—the maxillary ostium and the fronto-nasal infundibulum, to which we have just alluded. To this active pressure on the ostia we have added the negative pressure of impeded ventilation. This results in a mechanical retention of the secretion in impairment of function and in degenerative changes. Or the inflammation may simply extend to these cavities by *continuity* from the nasal fossæ. Either of these may be associated with the entrance of bacteria.

Another cause, and less uncommon than may be thought, of an acute maxillary, or indeed any variety of acute sinusitis, is the *plugging of the nostrils* in the case of *epistaxis*, or after application of cautery, or other intra-nasal procedure,—the operation itself being sometimes erroneously accused as the active exciting agent, whereas it may be only an accomplice before the fact. In such cases evidence is afforded of infection to the middle ear through the Eustachian tube, by rupture of the tympanic membrane and a purulent discharge through the external meatus.

Of a more directly traumatic nature may be named *excessive douching*, and the *careless use of cautery*, especially the *chemical*.

An acute infection of the accessory sinuses may occur simultaneously with an aural discharge, but may not perhaps be recognised until much later, when obstinacy in arrest of the aural discharge will induce the surgeon to examine more deeply. On the cure of such a maxillary or fronto-maxillary suppuration, prompt arrest of the otorrhœa is not infrequent.

These parenthetical remarks on otorrhœa will prepare us to consider other factors of acute sinusitis in the *young*. Several cases have been recently reported of this condition in the infant, and it may occur to even the newly born. At the outset I would say, although the rudimentary character of the frontal sinus of the infant is an argument against its early infection, this by no means follows in the case of the maxillary, albeit it is rare until the age of puberty. The causes for such a circumstance are sufficiently varied and direct. In the newly born may be named (1) injury by instruments in delivery; (2) the infection by vaginal discharges of the mother, as in a case reported by D'Arcy Power of an infant æt. 8 weeks; and (3) in the infant at breast, by absorption through the nostrils of purulent secretions from a sore nipple, as in another case reported by Douglas, in which the little patient was but 3 weeks old.

It has been suggested that in these cases the disease is not an *empyema*, but an acute *osteomyelitis*. The symptoms might

possibly represent an *acute periostitis* due to staphylococcal infection, but the term osteomyelitis is hardly applicable, for at no period of life do these air cavities partake of the nature of marrow-holding chambers, and at early infancy the diploetic walls are so exceedingly thin, as to still further exclude the existence of myeloid spaces.

Dental caries is a frequent cause of disease of the maxillary antrum, but I am inclined to the opinion that when such is the case, sinusitis commences in a sub-acute rather than in an acute form.

What is the history? A patient has violent toothache, of a character recognised by dentists as due to an abscess at the root of the fang. On removal of the tooth the pain is promptly relieved. In such a case (1) the inflammation, if it has extended to the alveolus, proceeds no farther; (2) the dental abscess may have infected the alveolus, and this may be extended to the antrum; or (3), especially when the alveolus is naturally pervious, the infection may proceed directly to the antral cavity. As a rule, nasal discharge of a purulent character is *not observed till some weeks or months later*, and it is most rarely in one of these dental cases that a history is given of any constitutional disturbance or fever which would point to an acute inflammation of the antrum itself. This point is not unimportant, for Zarniko, writing in 1894, quotes Siebenmann and Kuchenbecker in support of dental caries as the cause of acute sinusitis. On examining the five cases of maxillary empyema, all of dental origin, classified by Kuchenbecker as acute, I find that no case had existed less than a month, and one as long as three months. This is a more than usual limit allowed between origin and recognition of an acute inflammation.

To complete this question as to the dental origin of maxillary empyema, it may be now acknowledged that it is by no means so frequent a cause as was held a few years ago. On the other hand, it was this variety that first attracted the attention of the rhinologist, who had hitherto failed to recognise the disease as due to intra-nasal or intra-antral causes, which had, however, always existed.

The SUBJECTIVE SYMPTOMS of an acute sinusitis are generally an increase of all those feelings of discomfort which characterise an acute nasal catarrh, the chief being a persistent neuralgia in the supra-orbital region, and it may be through the globe of the eye, with photophobia and lachrymation. This neuralgia, which is often thought to be the malady itself, may

endure for ten or twelve days, with occasional incomplete remissions, to be followed by exacerbations of increased agony. The patient's complaint is of a tight constriction of the frontal portion of the skull, with intense throbbing and pulsation. None of these nervous symptoms are alleviated in any appreciable degree by any drug, whether locally or constitutionally administered. Deafness, tinnitus, and pain in the ear are also not infrequently to be observed, in which case the tympanic membrane should be examined for the purpose of establishing or excluding a median otitis. The attack subsides apparently without effect, a circumstance which confirms the original diagnosis of neuralgia; or it terminates in serous or purulent discharge, which is seldom seen to flow by the anterior nostrils, but, running down the back of the pharynx, often appears to justify a mistaken diagnosis of simple naso-pharyngeal catarrh, which is equally erroneous.

When the **larynx** is attacked, sharp pricking pains are felt, with hoarseness, cough, and other characteristic subjective evidences of a laryngitis; and the same may be said, *mutatis mutandis*, of further extensions to other portions of the respiratory tract.

Attempts have been made to diagnose the particular cavity which is involved, by localisation of the pain, but without success, particularly in the case of an acute attack; and it would appear that whichever of the four cavities, and however many of them, are inflamed, *supra-orbital pain is the rule*, and that other regional pains are for the most part coincidental. In any case a **differential diagnosis** can be better determined, and is of more importance in the chronic than in the acute form. Recurrence of these attacks, unaccompanied by the preliminary head cold, are not infrequent; and without doubt many so-called relapses of influenza, with acute cephalgia, are in truth but renewals or advances of inflammation of an accessory cavity.

The **external** signs are not strongly marked, being almost *nil* in the case of the maxillary antrum, and absolutely so in that of the ethmoidal and sphenoidal. When the frontal sinus is the seat of attack, there may be some œdema of the eyelid, puffiness at the inner canthus, lachrymation, and epiphora.

As to PHYSICAL SIGNS, examination within the nares is almost always fruitless on account of general swelling, when rhinitis is present; but after application of cocaine, the turbinals as well as both lateral walls of the nostril can be seen to be swollen, red, and puffy, with the occasional appearance of small

ecchymoses, these especially when the case arises as a complication of an exanthematous fever. If the attack has arrived at the stage of suppuration, one or both nasal fossæ may be full of pus or muco-pus.

The appearance of the patient is somewhat distinctive. The countenance is pale and fatigued, sometimes earthy. This last, however, is more particularly observed in the advanced form of a well-established suppuration. The patient's brow and cheeks often perspire profusely. Generally he is much prostrated. With extension to the air-passages there may be noticed cough, at first dry, and later with abundant expectoration, in which both pus and blood may be seen. Indeed, a diagnosis of acute tuberculosis is not unfrequently hazarded, which, however, is not confirmed on auscultation, only bronchial râles being heard; and by the absence of tubercle bacilli on bacteriological examination.

DIAGNOSIS.—Great assistance in diagnosis would doubtless be afforded by employment of the **thermometer,** but any recommendation of its regular use in what is generally thought to be a common head cold, however severe, would be probably met with a contemptuous smile, not alone from the family practitioner, but from many a teacher of general medicine.

Much help may be afforded by **percussion,** and preferably with the pleximeter. In the case of an acute inflammation of the maxillary sinus, *pain* will be felt by gently striking the upper bicuspids, and particularly the first upper molar, and one or other of these teeth may be loosened, and the gum may be seen to be inflamed. When the frontal sinus is involved, quite light percussion over the brow, and especially just above the inner canthus, will greatly increase the pain. The only other disease, except neuralgia, with which acute sinusitis could reasonably be confounded, would be that of an acute periostitis of a syphilitic character.

Viollet relates one of this nature:—

CASE CCXVI. occurred in a female, æt. 37. Within five days a large swelling developed under the left eyelid, and extended towards the middle line. There was infiltration of the eyelid, and of all the surrounding tissues. The surface colour was unchanged. Diagnosis of the real malady was chiefly relied on by the more moderate pain experienced on percussion of the brow, and was confirmed by the quickly beneficial effects of iodide of potassium.

COURSE AND TERMINATION.—It might be advanced that, notwithstanding the frequency with which sinusitis is to be found if looked for post-mortem, it is a disease which is of such accommodating latency as to almost excuse its oversight. Such used

to be the view taken, and unfortunately is still taken, by many, with regard to chronic purulent discharges of the ear in relation to diseases of the brain. Twenty years ago an estimate of 20 per cent. of meningeal inflammation, due to middle ear disease, would have been thought excessive. In Vienna, it is now calculated that at least 80 per cent. of acute affections of the meninges are due to extension from the middle ear.

And so it is with the accessory cavities, for already cases have been reported of extension of a maxillary inflammation to the other cavities, and a subsequent death from meningitis; and at least one case has been recorded—the one I allude to is by Rafin—from brain disease directly following on an acute coryza, with purulent inflammation of the cavity of the frontal sinus, which required liberation with the knife, and was followed by caries, extrusion of sequestra, and double optic neuritis.

As to the **course** of an average case of acute sinusitis, it has already been more than once hinted that the issue of the majority is satisfactory. None the less, however, ought they all to be recognised, for, as Lermoyez has done well in insisting, *an acute inflammation is almost invariably amenable to cure without operation.* On the other hand, non-recognition or procrastination in treatment is likely to lead to *the chronic condition, in which no remedies are available except the surgical.*

These will receive consideration in the next section.

PROGNOSIS.—From all that has been said, it will be readily appreciated that the forecast will be favourable in proportion to the promptitude with which the true nature of the symptoms is recognised, and that the penalty of carelessness or ignorance is not always a light one.

In the class of case under present consideration, so soon as the tumefaction of the intra-nasal soft tissues is reduced, and the blocking of the natural exit of the sinus is diminished, a remission of pain will be experienced, to be still further prolonged when the passages become quite free. An acute sinusitis has a duration of about eight days; if it passes into the sub-acute, the symptoms may be prolonged, though in modified intensity, to two or three weeks; or, lastly, it may become chronic.

In estimating the value of the prognostic features of sinusitis, it may be useful to remember that the anatomical and regional points of difference in the various cavities which have been detailed, may exercise influence on the forecast. For example, an inflammation of the **maxillary antrum,** so long as it is isolated, takes for the most part a benign course, although

it may secondarily affect the eye. It is grave in the **frontal,** because of the thinness and occasional absence of the posterior wall of the sinus which forms the partition from the brain, abscess of which is to be apprehended. With regard to the **ethmoidal,** we have to fear basal meningitis, though the relation of these cavities to the orbit forms a point of escape of less, but still sufficient, gravity; and even then there is the possibility of intracranial extension of the inflammation along the sheath of the optic nerve. Inflammation of the **sphenoidal** cavity is of all the one of gravest danger, from the liability to thrombosis of the cavernous sinus. It is all the more serious because surgical procedures in the sphenoidal region are so hazardous as not to be always justifiable or even practicable. Happily, however, this cavity is the least often attacked.

Lastly, it is to be borne in mind that all the accessory cavities, except that of the maxilla, share with the mucous membrane of the nasal fossæ an intimate connection with the sub-arachnoid lymph cavity.

TREATMENT in the early stages consists in adopting measures for the relief of an acute rhinitis more active than are contained in the advice so generally given to wait upon the issue. Of **general** remedies, I lay particular stress on the value of camphor, quinine, and belladonna for the arrest of the coryza which marks the early stages of an acute nasal catarrh (Form. 104); and the other remedies advised for acute rhinitis at page 767 in the previous chapter may be administered according to the indications. Where there is much fever, aconite may be given in small and frequent doses, but naturally with caution (Form. 87). As to **local** treatment, I employ menthol in spermaceti powder as a snuff (Form. 72), or menthol dissolved in oil as a spray (Form. 64), preferably to cocaine (Form. 45 or 71) or antipyrine (Form. 43), both of which are in favour, but neither is altogether free from risk when the attack is associated with influenza. To the menthol solution may be added iodol when evidence is afforded of pus in the nasal flow. Some Continental specialists recommend a solution of menthol in alcohol, but this medium gives needless pain, as anyone may realise by spraying a little pure alcohol into his own nose. Steam inhalations are useless to a nostril the lumen of which is narrowed by tumefaction to the merest slit, and nasal douches do but aggravate the evil. External fomentations as hot as can be borne, and the surface painting of chloral and camphor—equal parts triturated to a fluid (Form. 53),—both aid in giving relief to the frontal pain.

Lastly, if an opening into the cavity is deemed necessary,—and it is only advisable in maxillary cases,—it should be preferably made through the inferior meatus by a Lichtwitz trocar.

Chronic Sinusitis.

A few prefatory remarks are necessary to correct some mistaken impressions as to the nature of chronic inflammations of the various accessory cavities.

In the first place, as has been shown, an acute stage is in the vast majority of instances an essential antecedent of the chronic, and non-recognition of this circumstance not infrequently responsible.

Secondly, it is generally taught and accepted that chronic sinusitis—especially of the maxillary antrum—is always of the nature of an empyema. This idea, which originated in the assumption that the sole cause of antral inflammation was dental caries,—and probably it is purulent whenever this is the case,—should have been dissipated so soon as it was recognised how frequently sinusitis—irrespective of the cavity—is of nasal origin. But most unreasonably this tradition has persisted.

Thirdly, although there is much in every chronic sinusitis of close resemblance in clinical features and indications for treatment, each one, on account of its anatomical position and relations, has, in a sense, special morbid features and sequelæ peculiar to itself.

The varieties of chronic sinusitis, which are common to all the cavities, may be grouped under four headings, as follows:—

1. Catarrhal or mucous.
2. Serous or dropsical.
3. Purulent.
4. Cystic.

1. **Catarrhal.**—This is the condition most frequently found as the sequel of a neglected acute endo-rhinitis. It is often not obviously manifested until the nasal inflammation has itself become chronic, when it is seen in association with general thickening of the nasal mucosa, œdema, and polypi; each and all of these several conditions leading to ostial obstruction. The mucous inflammation within the sinus may thus arise by direct extension from the nasal mucosa, or may be secondary. Bergeat is of opinion that 30 per cent. of cases of polypi of the maxillary sinus are associated with mucous rather than with purulent accumulations.

2. **Serous.**—As a reaction against the old teaching that all antral accumulations are of the nature of a hydrops, the newer school of rhinologists have endeavoured to show that such a condition never exists, and that all limpid secretions of this cavity are cystic in origin. But quite recently Dèlie, Dmochowski, and Krebs have each demonstrated cases in which there was no cyst wall, and have interpreted them as examples of a true dropsy. The most common cause of antral hydrops is a lessened resistance in the vessels. This condition may be *active* or *passive*; the first as the result of inflammatory exudation following obstruction of the ostium; the second, as it may occur in renal disease.

3. **Purulent** inflammation may be a simple sequel to an acute or sub-acute inflammation, or may represent an advanced stage of a chronic (mucous) catarrh. A serous accumulation may also become purulent, and in fact, although each of these three varieties can be differentiated, the transition from one to the other is so subtle, that a sharp definition cannot be always established.

Suppuration of a sinus may be due to purely *local* or to *constitutional* conditions, both to be further considered presently.

A purulent sinusitis may persist as a chronic empyema, or may become caseous; lastly, the disease may be arrested by sclerotic changes in the muco-periosteum.

Histo-pathology.—In the first of these three phases, that of the **chronic empyema**, the lining membrane will be found to be considerably thickened to the naked eye, and on microscopical examination this hypertrophy will be seen to be of the nature of granulation tissue, which will in places be accentuated by the formation of inflammatory polypi. More deeply the osteoclasts will be generally found both numerous and large; in some instances these give rise to bone absorption, particularly in the ethmoidal region; whilst in others the changes consist of an ossifying periostitis, terminating in buttresses of bony tissue, or in general thickening of the osseous walls. When the empyema is the result of dental caries, the changes are naturally much more localised than when the cavity is invaded from the nose.

In the **caseous** variety the fluid elements of the pus have become absorbed, and the cellular elements have undergone cloudy and fatty degeneration, accompanied by luxurious growth of bacteria, of which the most frequent is the *Staphylococcus pyogenes*

aureus, while the most interesting and pertinent—though more rare—is the *Aspergillus fumigatus*.

In the **sclerotic** form the natural characters of the mucous membrane are quite transformed, the change being characterised chiefly by the formation of densely packed fusiform cells, with bundles of white fibrous tissue inseparable from the periosteum.

Of the other forms of chronic sinusitis the **catarrhal** presents no features of histological interest beyond changes in the surface epithelium and hyperæmia. The **serous** or dropsical form is now believed to be an exaggeration of a simple catarrh. The accumulation is the direct result of obstruction to escape, coupled with the fact that the exudation changes are more rapid than are those of absorption.

4. **Cystic** sinusitis may originate in two ways — By distension (1) of lymph spaces, or (2) of the gland acini or ducts.

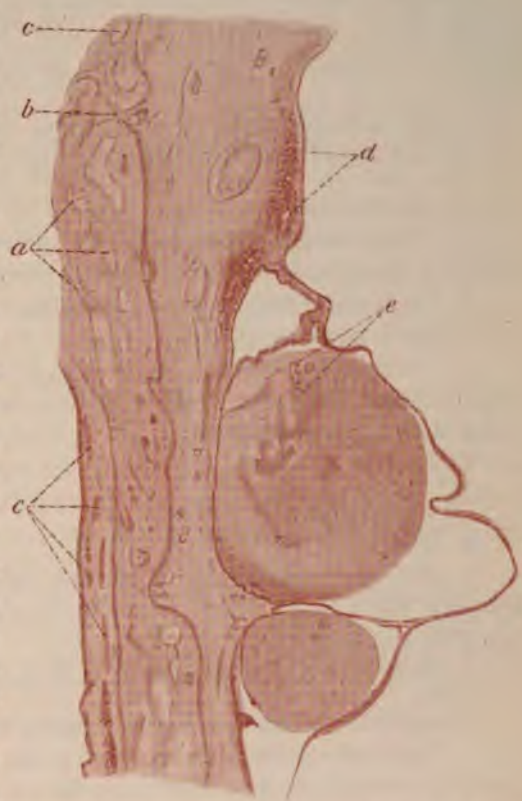


FIG. CCCCI.—CORONAL SECTION OF THE MAXILLARY SINUS, THE SUBJECT OF CYSTIC DISEASE (AFTER ALEXANDER).

a. Cancellous spaces in bony wall; *b*. region of the crista turbinalis; *c*. glands of nasal fossa; *d*. glands of the maxillary sinus; *e*. degenerating gland tissue. The wavy lines around indicate the capsule of the cyst.

Fig. CCCCI., from a preparation by Alexander of Berlin, exemplifies a condition due to the first-named cause. It is characterised by excessive cancellation of the bone, by distended gland ducts, some patches of round-cell infiltration, and a cyst-like inclusion of a mass of diseased glands and blood vessels.

Chronic Empyema of the Maxillary Sinus, or Antrum of Highmore.

Etiology.—Without giving further detailed consideration to the many factors which have been enumerated as responsible for an acute inflammation, they may be briefly classified in relation to chronic disease. They are both local and constitutional.

Local influence may be exerted in two ways, by *obstruction* and by *extension*; we thus have as causes—

By **obstruction**—

1. Hypertrophic rhinitis in its different forms, with a persistent or frequently relapsing blockage of the antral apertures.
2. Intra-nasal and septal deformities.
3. Intra-nasal neoplasms.
4. Traumatism—which includes over-douching; cauterisation, chemical and thermal; foreign bodies, including tampons; and some intra-nasal operations.
5. Parasites.

By **extension**—

6. Dental caries.
7. Atrophic rhinitis, by which the morbid process not only involves the antral lining, but also specially favours bacterial infection and growth.
8. Auto-infection of one sinus from another.

Constitutional causes may be again named—

9. Epidemic influenza, erysipelas, the exanthemata, and the infectious fevers; and to these may be added—
10. Syphilis.
11. Tubercle.
12. Mercurial, lead, and phosphorus poisoning.

Some of the local causes gain increased significance in relation to a chronic empyema, and therefore demand further attention.

Many inflammatory attacks, whether catarrhal or purulent, subside spontaneously, but not so in all cases: setting aside those due to dental caries, it is interesting to determine whether chronic antral affections are always caused by extension from the nasal mucosa, or whether they arise independently within the cavity or its walls. The question is still an open one, and probably there is truth on each side of the shield.

For example, as to polypi, some observers, Grünwald of Munich for one, are of opinion that wherever nasal polypi are present they are causal of disease in one or other of the accessory cavities. Chiari, E. Fränkel, and Schmidt dispute the accuracy of such a sweeping assertion, and my personal experience leads me to agree with them. Schmidt pertinently remarks that polypi as a rule are bilateral, whereas an empyema is usually one-sided. It is also to be remembered that the majority of nasal polypi arise at a point superior to the position of the ostia, and it is reasonable, therefore, to assume that in some cases at least the accessory cavities may be infected secondarily from the secretions of the neoplasm. I would not, however, deny, though I think it is rare, that nasal polypi may be even more directly the cause of an empyema. For certainly, in some cases, the nasal polypi may be the actual outcome of changes in the mucosa from saturation with antral discharges.

On the other hand, it is equally difficult to determine to what extent atrophic forms of rhinitis are responsible for antral disease. Wherever they are so, it is probable that, in addition to the particular constitutional dyscrasia, as syphilis or struma, the process of antral implication is by bacterial infection rather than by extension through continuity.

Lastly, whether the disease itself is due to hypertrophy, new growth, or atrophy, it is important to remember that, whilst the lining membrane may suffer without extension to deeper structures, these latter parts as represented by periosteum and bone are never diseased without involving the mucosa.

SYMPTOMS.—As pointed out in a paper I read at the Harveian Society in February 1879, the classical indications of maxillary empyema described in text-books, such as 'pain, heat, redness, and swelling' of the soft parts externally, even to expansion of the whole jaw, are chiefly conspicuous by their absence, except in those rare cases in which the normal antral aperture is actually closed, — quite possible in the case of a foreign body, — or coincident on a neoplasm or cystic tumour.

Fœtor is not always present, but when evinced can usually be distinguished from the ozæna of atrophic rhinitis by observance of the hints already given in the section considering that disease. When a tooth is at fault, as can generally be ascertained on inspection, there will be found either the site of a removed tooth, the remains of a stump, or, possibly, a 'filled' cavity. Diagnosis on this point will be confirmed by history of

severe toothache some short time previous to the date of first appearance of the nasal flow. Occasionally there may be seen swelling or redness of the gingival mucous membrane of the affected side, or, in other cases, a shrinking of the gum. When dental disease is not obvious on mere ocular inspection, it sometimes becomes evident on *digital palpation* or *percussion* of the teeth separately: the resultant sensation, even where toothache has ceased, is one of tenderness, especially in the region of the canine fossa. This tenderness is also felt in the ordinary pressure of mastication. In cases where the nasal orifice is closed, the objective evidences of distension may be supplemented by *infra- and supra-orbital neuralgia* and *diplopia*; but it may once more be remarked that in many cases no symptoms may be complained of, except that of a morbid flux, the site and character of which must determine the diagnosis.

Discharge.—The main diagnostic point of antral suppuration is that the flow-discharge is unilateral, of very fluid consistence, opaque, and of pale lemon-yellow colour; this is, as a rule, unconnected with any ulceration of the rhinal mucous membrane of the affected side. On the contrary, although there may be granulations, the membrane is often pallid and sodden, even to the extent of œdema. In some cases it is even atrophied. But above all, the patient is always personally conscious of the offensive character of the flux to a greater degree than are those with whom he associates. This is distinctly contrary to the experience of the subject of ozæna due to atrophic rhinitis; the explanation being that in the last-named disease the olfactory cells are invaded, which is not the case in empyema of the antrum, or, indeed, of any of the other accessory cavities. For the same reason neither the sense of smell nor of taste is much impaired. On *visual examination* of the (illuminated) nasal cavities, pus of the nature described will almost always be seen to be oozing from under the anterior extremity of the middle turbinal body of one side. If this be gently wiped away with cotton-wool on a probe, the discharge will not continue to flow, unless the patient be made to sneeze, or to lie on a couch with the head slightly bent downwards, when the discharge will as a rule reappear. Exceptionally the purulent contents of the antrum will become caseated, and both objective and subjective signs will be absent for many years, until some acute exacerbation brings about such renewed activity as to lead to its identification.

Transillumination.—Increased experience of illumination of

the antral cavity by means of an electric light placed in the mouth, has inclined me to modify my former doubts of its trustworthiness to the practical surgeon. But it is apt to mislead, in view of the fact that the bony walls vary so much in their degree of thickness, as to render inequality of translucency of an antrum an uncertain indication of disease. Moreover, as more than one of the drawings in this work indicate, the cavity of one antrum may be very small, whilst its fellow may be unusually capacious.

Nevertheless the investigations of such careful observers as Voltolini, Heryng, Luc, and Ruault on the Continent, and of Logan Turner in this country, cannot be lightly dismissed. The general result of their investigations is that, in cases where the antrum is healthy, an infra-ocular crescent of translucency is observed when an electric light is placed within the mouth, other light being excluded by covering the heads of both patient and observer with a black hood or curtain. The absence of this crescent, or a marked diminution of transparency on one side, constitutes the differential element of diagnosis. Ruault has well remarked, having on one occasion been disappointed not to find pus in a case where transillumination showed a beautiful sub-orbital umbra, 'We can have opacity without empyema, but we cannot have empyema without opacity.' Probably if there be not empyema in such a case, there is some other intra-antral or perhaps intra-nasal mischief which accounts for the umbra, but the explanation may be purely anatomical. Ruault has also found, by putting the light to one or other side of the buccal cavity and using a nasal speculum, that there is a diminished luminosity of the nasal wall of the affected antrum.

Another indication, on which, however, there is not complete agreement, is that in those cases where it is possible to illuminate the eyeball, the pupil corresponding to the healthy antrum is brighter and redder than that corresponding to the cavity which is diseased. A difference in the subjective sensation of light may also be observed by the patient, that on the sound side being the more brilliant. With regard to all these experiments, Ziem has pointed out that illumination varies in certitude in proportion as the antrum is filled with pus, and may be almost useless when there is but little. One practical hint, be careful to remove any artificial denture.

Percussion and *succussion* of the antrum itself are diagnostic aids of but doubtful value, for, whilst not required in well-marked cases, they are but seldom capable of yielding any positive evidence of value in others.

Other methods of diagnosis are those of Mickulicz, with the modifications of Lichtwitz, Tornwaldt, etc. The normal ostium of the antrum is catheterised, or, failing that, the nasal wall of the antrum is punctured in the inferior meatus by a trocar (Fig. CCCCII.), and then, by syringing through the cannula, diagnosis is established by the escape of pus. Luc has used an aspirating syringe. In one case in which the Lichtwitz method was employed at our hospital, the issue of pus through the mouth demonstrated the existence of a dental sinus which had been hitherto overlooked.

The removal of the front part of the middle turbinal appears to be an almost everyday procedure in those Continental cliniques where exploratory tappings and injections are of routine procedure, while some operators even pierce the canine fossa and employ electric search-lamps for the purpose of simple diagnosis.

In common with most other British surgeons, I reserve such measures for those cases in which a diagnosis cannot be established by less severe criteria.

Personally, I may claim to have but once tapped an antrum without finding pus; but Ziem reports this occurrence in 9 per

FIG. CCCCII.—LICHTWITZ TROCAR, FOR EXPLORING MAXILLARY ANTRUM.

cent. of a series of forty-seven cases, a circumstance which seems to indicate that there is undue reactionary activity in antral surgery against the general apathy of a few years ago. Failure to find pus as an *immediate* result of operation must not, however, be too hastily accepted as evidence of erroneous diagnosis, as on more than one occasion a purulent discharge has been delayed for twelve or twenty-four hours after drilling, especially where the purulent contents have become caseated, or where, as is not infrequent, only an unaffected 'pocket' has been reached. It has been alternatively suggested that in such circumstance a purulent infection has taken place in the wake of the trocar.

Yet another method has been reported by Moreau Brown, in which the test is that of peroxide of hydrogen. The nasal passage is cocainised, and, with a hypodermic syringe with long cannula bent to a right angle within a quarter of an inch of the distal end, a solution of peroxide of hydrogen (1 to 12 of water)

is projected into the antrum through the hiatus semilunaris. If pus is present, it is driven out and fills the nose with white foam. By the use of this test, which the author maintains is very certain, it is claimed that purulency of the maxillary sinus can be differentiated from that from other sources in the nose. Notwithstanding that in nineteen cases, fifteen are reported to have been diagnosed by this method, it cannot be said to be easy of accomplishment, or by any means free from inconvenience and even alarm to the patient.

DIFFERENTIAL DIAGNOSIS of disease of one accessory cavity from another being for the present reserved, the only diseases of the nasal fossæ liable to be mistaken for antral empyema are syphilis and tubercle; in either of which the discharge may be unilateral. Careful consideration of points in the general history, the character of the ulceration,—if there be any,—and, in the case of tuberculosis a bacteriological examination, should clear up doubts.

TREATMENT.—A diagnosis of pus in the antrum having been unequivocably established, there should be no hesitation in adopting measures for its removal and permanent arrest. Nor must there be any lack of courage in the procedures adopted. But these may well be modified by the nature of the case; that is to say, (1) whether the empyema is *residual*, as following a catarrhal process such as is identified with a simple 'head cold' or influenza; (2) *passive*, as sequential to dental caries; or (3) *active*, as a part of inflammatory and necrotic changes.

In the *first* group, an acute catarrh having failed to terminate in resolution, there is hope that enlargement of the natural ostium, or at most the formation of a counter-opening in the inferior meatus followed by irrigation, may prove effective. In the pursuance of such procedures, as in all intra-nasal operations, thorough cocainisation should be practised, not only for anæsthetic purposes, but for reduction of swollen tissue. Only when such reduction is not completely achieved by this means, is removal of the anterior end of the middle turbinal, and perhaps of the inferior also, justified.

In the *second* class something more is required. Should the necrosed fang of a tooth be still in the alveolus, it should be removed; but, as a rule, when the surgeon sees a case of antral empyema, this has already been effected by nature or by the dentist. Much has been written against removal of a sound tooth as preliminary to the tapping of the maxillary antrum through an alveolus; but, so far as my experience has

taught me, I should doubt the dental nature of an empyema where evidence of dental caries was absent, and I should, in such circumstance, not recommend an alveolar exit. It is true that the crown of a tooth may appear to be sound while the root is diseased, but, on the other hand, it so often happens by exception that the alveolus does not constitute the actual floor of the antrum, that one is hardly justified in removing an apparently sound tooth for the purpose of forcing an opening in that direction. Perforation of the antrum through the socket of a lost tooth or by the removal of a decayed one, or portion of one, is best effected by means of a trocar or drill (Fig. CCCCIII.). By this means an opening is made at the most dependent situation, and consequently at that which best assures a complete emptying of the cavity. It has to be borne in mind that the opening is to be kept sufficiently patent to allow frequent syringing of the sinus, and perhaps for a prolonged period. This is done by an instrument fitted so that the fluid employed (antiseptic or detergent), instead of returning through the alveolar channel, may pass through the nasal orifice of the antrum (Fig. CCCCIV.).

FIG. CCCCIII.—TROCARS FOR PERFORATING MAXILLARY ANTRUM THROUGH ALVEOLUS.

FIG. CCCCIV.—AUTHOR'S SYRINGE FOR IRRIGATING MAXILLARY ANTRUM THROUGH ALVEOLAR OPENING.

There is a joint at *a*. With a longer tube and suitable curves, the other accessory cavities can be irrigated with this instrument.

For the purpose of continuance of this irrigating process through the alveolar opening, my colleague, Mr. George Wallis, who has rendered dental assistance in all my cases, hospital and private, for the past twenty-five years, was the first to make and fit gold and vulcanite plates with cannula attachment and plug. The result has, in many instances, been completely satisfactory, though the length of time occupied in effecting a cure has varied from a few weeks or months to (in one case) even

years. The use of the little gold plug prevents food from passing into the antrum during mastication, and obviates one of the minor objections against selecting this site for an opening.

If exit through the natural ostium be incomplete, a supplementary opening may be made through the inferior meatus, by means of the Krause trocar (Fig. CCCCV.), which constitutes the operative complement of the Lichtwitz exploratory tube. Where all the teeth are sound, Krause's trocar may be well employed as a compromise, or it may be as a tentative preliminary to more thorough measures, for—at least in private practice—it is advisable to first essay a cure by milder measures, which, in the trouble under consideration, are in no sense a bar to more radical procedure, should they prove ineffectual.

To decide when it is really safe to allow the surgical opening to close, is a point of some nicety; for if it be allowed to close too soon, a reopening may be called for; and should its patency be maintained too long, the chronicity of the disease may become more strongly confirmed. This last is, moreover, likely to occur if irrigation be too long continued. I am in the habit of advising my patients, so soon as the fluid syringed into the cavity returns clear, to keep the cannula closed for gradually increasing intervals, and only when the immunity from fœtor and pus is maintained after closure for a period of not less than twenty days, do I permit removal of the plug. Nevertheless, even with such precautions, I have seen two instances of relapse, one at an interval of a few months, another after many years. In one of my earliest cases I only succeeded in effecting a cure after searing the cavity of the antrum by means of galvano-cautery, introduced through the alveolar aperture. Another very chronic case was cured by the patient inadvertently using a solution of chloride of zinc, 40 grains to the ounce, which had been prescribed for dilution to an eighth of that strength. Patients become quite accustomed to the cannula, especially if, as is often convenient, it is fitted to an artificial dental plate, and

FIG. CCCCV. — KRAUSE'S TROCAR AND PILOT FOR CANNULA, FOR PERFORATION OF MAXILLARY ANTRUM THROUGH INFERIOR MEATUS (HALF SCALE).

as no harm is likely to accrue from its retention, I never urge a timorous patient to dispense with it prematurely.

Should all these methods fail, it is clear that the case is one of the *third* class, in which no mere perforation for escape of pus, or irrigation, is likely to be efficient. We are therefore called on to make an opening which shall be sufficient for thorough exploration and effective clearance of the whole cavity. This is to be done by removal of a considerable portion of the anterior wall of the antrum through the canine fossa. The following are the steps of the procedure:—

1. Snip the bucco-gingival fold, and completely retract all soft tissues and periosteum by means of a raspatory.

2. For the actual opening into the fossa, employ a trephine, with the further use, if needed, of burr or chisel. The advantage of the trephine is, that with the removed circle of bone there generally comes the corresponding portion of soft lining, and thus the character of the granulations or neoplasm is at once demonstrated. The aperture must be made sufficiently large for admission of the little finger of the operator, and for searching by direct or indirect illumination.

FIG. CCCCVI. — SKULL SHOWING POSITION (*a*) OF DRAINAGE TUBE FROM MAXILLARY ANTRUM; (*b*) FROM FRONTAL SINUS, THROUGH THE NOSE (AFTER LUC).

3. Carefully remove all exuberance of granulation tissue (the fungosities of French surgeons), caseous masses, polypi or cystic growths, taking especial heed to break down every rigid partition, so that no sulcus or pocket may remain uncuretted.

4. The operation is completed by making a counter-opening from the lowest point of the cavity into the nasal fossa. In some instances it is necessary to keep this opening patent by an indiarubber drainage tube (Fig. CCCCVI.). In any case the antrum is plugged with iodoform or sublimate gauze.

A case so treated should heal in from three to four weeks. If it does not, it is probable that another accessory cavity, the frontal or ethmoidal, or both, are also involved, and treatment of those regions — by methods to be presently detailed — must be undertaken before a cure can be achieved.

Chronic Diseases of the Frontal Sinuses.

As has been stated, catarrhal suppuration of these cavities is much more commonly found in association with rhinitis, both simple and specific, than is the case with the maxillary antrum. This may be accounted for in three ways, of which two, *continuity* and *projection*, have already been considered. The third is that of apparently spontaneous development of cysts and granulation tissue. Such a state may be due to closure of the infundibular outlet, either by reason of the presence of nasal polypi or hypertrophies, or from tumours, such as myxomata, growing from the lining of the sinus itself.

Symptoms, Signs, and Diagnosis.—One-sided *pain* over the site of the sinus, often too hastily dismissed as 'neuralgic,' is a prominent symptom. The pain, which is usually found to be increased by pressure over the upper margin of the orbit, is not, however, always unilateral. Added to this, there may be an actual swelling of the integument over both the upper and lower superciliary ridge, with a possible orbital cellulitis confined to the upper lid and inner canthus.

Further evidence will be afforded by *anterior rhinoscopy*. Pus will be seen to issue from the neighbourhood of the bulla. This discharge is more persistent than when proceeding from the antrum or other sinuses. If the pus be wiped away with a pledget of cotton-wool, preferably soaked in cocaine so as to reduce tumefaction, the discharge will re-appear after an interval, if the patient remains in the erect position, but not if he takes the horizontal; nor is it increased, as in the case of a maxillary empyema, by any lowering of the head or inclination to either the right or left side. The accumulation may be favoured by nasal inspiration, the nostrils being closed with the fingers; but none of these signs exclude a possibility that the discharge may be ethmoidal or even sphenoidal.

Two further tests may be employed—*first*, *catheterisation*, if possible, through the infundibulum, followed by inflation with air, the entrance of which can be verified by the stethoscope applied over the brow; *secondly*, *transillumination* by a shielded electric light placed at the inner angle of the orbit, and pressed well on to the orbital plate which constitutes the floor of the cavity. An *umbra* should be witnessed on the affected side, but unfortunately this test is vitiated by the frequency of asymmetry. The same cause is liable to discount the value of percussion, which has been alluded to as trustworthy in the case of an acute sinusitis in this region.

PROGNOSIS.—As distinguished from a maxillary empyema,—which is attended mainly by social inconvenience,—the outlook of suppuration in the frontal cavity is always a grave one, from the liability to meningeal extension. The gravity may, however, be greatly modified if the patency of the infundibulum can be re-established and maintained.

TREATMENT.—This maintenance of infundibular patency is the object of all treatment, and is to be effected by *first* of all freeing the hiatus semilunaris of all hypertrophies and polypi; and, *secondly*, by careful catheterisation. I have relieved many such cases by thus clearing the entrance to the infundibulum. An intelligent patient can even be taught to irrigate the cavity himself by this means through the natural opening (Fig. CCCCVII.).

FIG. CCCCVII.—INFUNDIBULAR IRRIGATION TUBE, FOR PASSAGE THROUGH ANTERIOR NARES (ABOUT THREE-FIFTHS SCALE).

When the obstruction is of nasal origin, catheterisation and reduction by cautery of the swollen condition of the mucous membrane around the orifice, may constitute the only treatment necessary. After the stenosis has been relieved, the secretions usually assume a healthy character in the course of a few weeks.

When such a result is not attained, no delay should be allowed in making an exploratory opening into the cavity. There are two methods—(1) the median, by which each cavity can be explored at the same time; and) 2) the lateral. I have employed both, and the accompanying small drawing from an actual case (Fig. CCCCVIII.) illustrates the advantage of the median, for it will be seen that, while on one side the cavity is blocked with granulations, the lining membrane of the other is smooth and clear. There is, however, some disadvantage attendant on trephining in this situation, namely considerable disfigurement, owing to a depressed cicatrix; this sometimes intensified by the necessity to keep open or to re-open the wound. On this account, and for some others, the later opening is to be preferred; and the following are the steps of the operation which is now known as the Ogston-Luc.

FIG. CCCCVIII.

1. Shave the eyebrow, and cleanse both the external parts and the nasal fossæ, the latter by a douche.

2. Make the incision through skin and periosteum carefully along the lower line of the eyebrow—*stopping short of the supra-orbital notch.*

3. Employ raspatory and retractors for exposing the bone.

4. Employ a trephine sufficiently large to obviate necessity to extend, for the area of this cavity can be thoroughly explored without laying it bare to its whole length.

5. Remove by sharp spoon every particle of the morbid contents before exploring the infundibulum.

6. Pass a suitably curved director by the infundibulum into the nose and out of the corresponding nostril. The direction to be taken is downwards, slightly backwards, and inwards (towards the median line). When in the fossa it must be brought directly forwards. This direction is shown in the illustration (Fig. CCCCVI.).

7. The infundibulum may now require to be enlarged and to be curetted, a difficult procedure by any instrument at present in use. I have therefore constructed a director (Fig. CCCCIX.), which, when once passed, can have fixed to its end a curette, and when this has served its purpose, the next step is—

8. That of threading and withdrawing back to the upper wound: this can be effected with the same instrument.

9. Attach to the thread a Luc or author's drainage tube (Figs. CCCCX. and CCCCXI.), and draw it back through the nostril, so that the cup rests on the floor of the sinus.

10. The cavity having been cleansed and swabbed with a zinc chloride solution about 5 to 6 per cent., the external wound is to be *entirely* closed, by being brought together with gut sutures.

11. [Some surgeons are careful to insert deep sutures through the periosteum, in addition to the superficial through the skin, but this procedure is not recommended, as it only retards union.]

12. The after-treatment is simple: the drainage tube, which, while *in situ*, is irrigated twice or thrice daily, is later to be removed by drawing it outwards through the nostril.

If, as is probable, there is no surgical fever, no haste should be displayed in taking this tube out; and pain unaccompanied by increase of temperature is no indication for its removal. The longer the tube is left, the more complete will be the drainage, the more permanent the patency of the enlarged infundibulum, and the closer and firmer the union of the wound of incision.

The tube should never be withdrawn earlier than the fifth day, and may with advantage be retained till the eighth or tenth. It is of course important to see that it is not blocked, and to continue irrigation even if there be no discharge.

Some difficulty may be experienced in removal of the tube: this will be due to two causes, *first*, the liability to forget that the axis of the infundibulum is not that of the nares. The tube is therefore to be drawn *not directly downwards*, but, being grasped in a pair of long-bladed strong forceps, passed up as close to the hiatus as possible, a forward direction should be given, so as to make exit from the nostrils at almost a right angle.

The *second* difficulty is caused by an unnecessarily large cup to the ampulla of the tube, but in any case this is an obstacle

which can be overcome by one or two radiating slits or V-shaped removals in the circumference.

To further obviate any difficulty of this nature, a tube has been

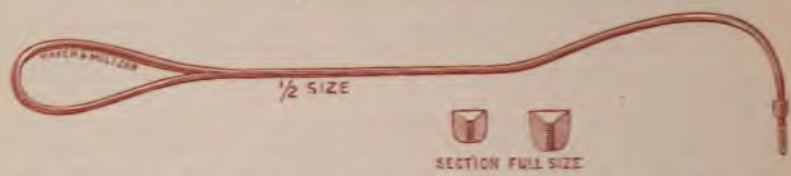


FIG. CCCCIX.—AUTHOR'S INFUNDIBULUM PROBE, CURETTE, AND BODKIN.

made for me by Messrs. Mayer & Meltzer, the funnel of which is of thinner substance than that of the tube itself (Fig. CCCCXI.).

If all these directions and hints are observed, no complication is liable to arise, and a complete recovery may be anticipated in

FIG. CCCCX.—LUC'S DRAINAGE TUBE.

A. Cup in section (full size). The dotted lines indicate V-shaped incisions, to facilitate withdrawal.

FIG. CCCCXI.—AUTHOR'S DRAINAGE TUBE.

B. Section (full size) shows thinner walls of ampulla. The dotted lines indicate where to shorten funnel, so as to prevent puckering when in position.

about three weeks; but haste and carelessness of detail are apt to carry the penalty of delay in union, with the result of an annoying fistula. Lastly, failure to effect a cure may be due to implication of some other of the accessory cavities which has been

overlooked, or possibly, as may occur in all these cases, to a tuberculous degeneration.

CHRONIC DISEASE OF THE ETHMOIDAL LABYRINTH.

Whilst it is to be accepted that much that has been said with regard to the diagnosis of disease in the other cavities will apply to suppuration in this region, some additional information can be afforded.

In the *first* place, it is to be remarked that a restriction of inflammation to any one group of the ethmoidal cells, anterior, middle, or posterior, is to be deprecated as arbitrary.

Recalling to memory the distinctive *anatomical* feature of extreme thinness of the cell boundaries of this labyrinth, as well as the extremely active cancellation process which is at work, one can understand the liability to misinterpret an *ethmoiditis* which is *simply suppurative*, for one of *necrosis*.

Secondly, the distinguishing *pathological* feature of ethmoidal suppuration is the abundance of granulation, and its readiness to undergo polypoid degeneration.

Lastly, the point of *clinical* distinction is the tendency to retention and caseation of the pus, which is the result of the highly anfractuous arrangement of the sinus cavity.

DIAGNOSIS.—With regard to suppuration in this situation, it has been said that when the *anterior and middle ethmoidal* cells are affected, there is pain in the forehead and top of the head, and a feeling of pressure behind the eyes; this may be uni- or bi-lateral; but that when the *posterior ethmoidal cells* are affected, pain is usually situated at the top and back of the head. It cannot be said that any of these arbitrarily localised symptoms are constant or trustworthy.

Empyema of the maxillary antrum and of the frontal cavity having been excluded, chief reliance of ethmoidal implication is to be placed on the site at which pus is seen on *anterior rhinoscopic examination*.

When pus is seen in the middle meatus, it probably proceeds from the *anterior* or *middle* groups of *cells*. When the fluid is seen to come on a higher level from the olfactory slit, bathing the mesial aspect of the middle turbinal and the corresponding portion of the septum, it is presumably due to suppuration of the *posterior* group.

Supporting these criteria will be (1) the evidence afforded by the probe: in health the sensation will be that of a firm smooth

cavity; in disease, of a pulpy substance; (2) undue prominence of the bulla; and (3) on puncture thereof an escape of fluid, purulent or serous. Reference to Fig. XXXVIII., p. 58, will facilitate appreciation of these facts.

FIG. CCCCXII.—GRÜNWALD'S FORCEPS, FOR OPENING UP ETHMOIDAL LABYRINTH, ETC.

When the posterior cells are mainly or separately involved, the olfactory sense will be notably impaired.

TREATMENT consists of first opening the bulla. This may sometimes involve removal of the anterior end of the middle turbinal, and is best accomplished by forceps constructed on the principle of that known as Grünwald's (Fig. CCCCXII.). Next

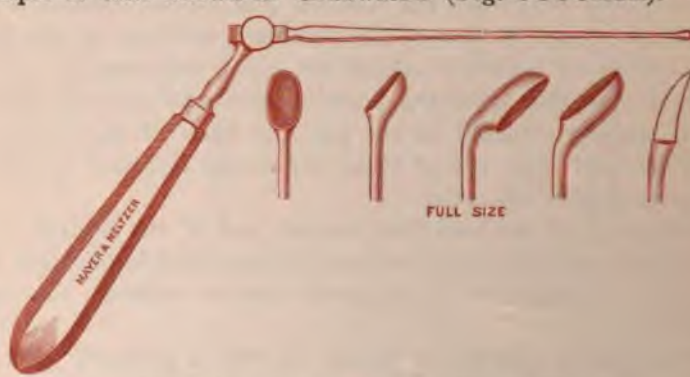


FIG. CCCCXIII.—GRÜNWALD'S ETHMOIDAL CURETTES.

comes the breaking down of cell septa by free curettement. For this we employ an instrument designed by the same surgeon (Fig. CCCCXIII.). This measure is rarely attended by any risk. Free irrigation should follow curettement.

Some authorities employ the galvano-cautery for destruction

of the superabundant tissue, and of the bases of polypi after removal by snare. In very many cases there is no true polypus formation, and this class may be most successfully treated by vigorous application of lactic acid on a firm cotton-wool-charged probe immediately after use of the curette. To insure a complete eradication of the disease under consideration, it is important to pursue the measures recommended not only with thoroughness and persistence, but with daily or almost daily vigilance.

Disease of the Sphenoidal Cavities.

Lesions of the **sphenoidal** sinuses may be either of a syphilitic, tuberculous, or polypoid nature. Sphenoidal discharges may be the forerunner, and possibly the excitant, of obstinate *post-nasal catarrh.* Caseous conditions of this region have been alluded to under *rhinitis caseosa.*

Diagnosis, on account of the inaccessible position of the cavity, is often impossible, or at least inexact, but the symptoms are in the main similar to lesions in the posterior ethmoidal cells, to which they are contiguous. Assistance may be given by exploring with Hajek's very flexible probe (Fig. CCCCXIV.).

Prognosis of disease in these situations is grave, both on

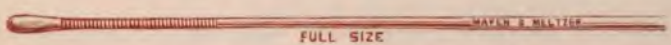


Fig. CCCCXIV.—Hajek's Probe of Soft Metal, for Exploring Sphenoidal Cavity (Probe End only shown).

account of their proximity to the brain, and of the anatomical difficulty in reaching them surgically.

Treatment will generally consist in irrigation by means of spray and douches, on the principles so frequently explained under previous headings. Catheterization, which I have proved to be quite possible on the *cadaver*, is not an operation which can always be carried out with precision on the living subject, and is, moreover, not unattended with risk, on account of the proximity of the cribriform plate and the cavernous sinus.

The same caution may be enjoined with regard to the attempts at curetting, the best instrument for which is Hajek's chisel-like hook (Fig. CCCCXV.).

New Growths of the accessory cavities may partake of any of the characters of those which affect the nasal fossæ proper, and have been frequently alluded to. Their further discussion would involve a too lengthy trespass on the domains of general surgery.

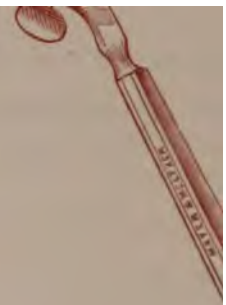


FIG. CCCCXV.—HAJEK'S SPHENOIDAL CUTTING HOOK (HA

emphasise the inevitable conclusion that only by an operation can a certitude of diagnosis be secured; this reason that I have given them at the end in beginning of this section.

TABLE I.

SIGNS OF A PURULENT SINUSITIS, IRRESPECTIVE SPECIAL CAVITY.

Presumptive.—

(*a*) Unilateral purulent flow.
(*b*) Pain relieved by liberation: spontaneous or surgical.
(*c*) Subjective fœtor.
(*d*) Polypi, and polypoid hypertrophies in the middle meatus.

Probable.—

(*a*) Pus at orifice influenced by attitude.
(*b*) Opacity on transillumination.

Certain.—

(*a*) Release of pus on irrigation.
(*b*) ,, ,, puncture and aspiration.
(*c*) ,, ,, puncture and irrigation.
(*d*) ,, ,, puncture and trans-sufflation.

TABLE II.

DIFFERENTIAL DIAGNOSIS BY SITE OF PURULENT DISCHARGE.

Pus in Middle Meatus.—

Anterior cavities { Antrum. / Anterior ethmoidal cells. / Frontal sinus. }

Pus in Olfactory Slit.—

Posterior cavities { Sphenoidal sinus. / Posterior ethmoidal cells. }

TABLE III.

SIGNS OF SUPPURATION OF MAXILLARY ANTRUM.

Presumptive.—

(*a*) Unilateral discharge.
(*b*) Intermittence of discharge.
(*c*) Infra-orbital pain (this is not constant).
(*d*) Subjective fœtor.
(*e*) Upper molar or bicuspid caries.
(*f*) Pus in middle meatus.
(*g*) Mucous polypi.
(*h*) Lateral swelling of cheek.
(*i*) ,, ,, nasal wall.

Probable.—

(*a*) Increase of discharge on bending forwards.
(*b*) ,, ,, inclination of head to opposite side.
(*c*) Opacity on transillumination.

Certain.—

(*a*) Puncture and irrigation.
(*b*) ,, aspiration.
(*c*) ,, trans-sufflation.

1. Inferior meatus.
2. Middle meatus—natural ostium.
3. Alveolus.
4. Canine fossa.

(*d*) Catheterisation with inflation and irrigation, through one or other of these orifices.

TABLE IV.

SIGNS OF SUPPURATION OF FRONTAL CAVITIES.

Presumptive.—

(*a*) Persistency of discharge.
(*b*) Pain { Irrespective of / Consequent on } pressure.

Probable.—

(*a*) No increase of flow on bending forwards.
(*b*) Diminution on supine position.
(*c*) Not affected by maxillary antral irrigation.
(*d*) Transillumination { Antrum—negative / Frontal—positive } but both may be positive.

Pus continuous.

Pain { Supra-orbital } irrespective of pressure.
{ Lachrymal } consequent on pressure.

Asthenopia (not distinctive).

Mental depression.

Probable.—

Lesions in middle meatus as seen on anterior rhinoscopy } pus, granulations, and polypi.

On probing—pus, bare bone.

Certain.—

Exploratory puncture of bulla, followed by irrigation.

TABLE VI.

SIGNS OF SUPPURATION OF SPHENOIDAL SI

Presumptive.

(*a*) Pain.

(*b*) Ocular disturbance.

Probable.—

Pus.

(*a*) Between septum and middle turbinal (by anterior rhinoscop

(*b*) On superior and middle turbinals and vault (by posterior rhi

Lesions in olfactory slit.

(*a*) Bulging in depth (in acute cases).

(*b*) Mucous polypi.

Certain.—

(*a*) Pus from ostium seen.

(*b*) Exploratory catheterisation.

(*c*) Exploratory puncture.

TABLE VII.

SIGNS OF SUPPURATION OF POSTERIOR ETHMOID

Presumptive.—

Same as sphenoidal.

Probable.—

A polypoid middle turbinal.

Certain.—

Return of pus, the sphenoidal having been previously irrigated.

Bare bone felt behind middle turbinal.

CHAPTER XXXI

AURAL MALADIES ASSOCIATED WITH NASO-PHARYNGEAL DISEASE

IN an early portion of this volume I have alluded to the absolute necessity for those who aspire to successfully treat throat affections, to be *au fait* with the principles and practice of aural surgery, as well as for the aurist to extend his investigations beyond the region of the ear proper to the passages of the nose and throat. Such remarks nowadays savour of truism, but it is only in comparatively recent times that writers on throat and ear diseases have sufficiently insisted on this fact. Even now the departments of the ear and throat are kept distinct in those of our general hospitals, where such special departments exist, and they are officered by different practitioners in each case.

The statistics of the Central Throat, Nose, and Ear Hospital afford incontestable proof that such an artificial divorce of subjects, which are by nature so closely wedded, is calculated to lead to incompleteness both of diagnosis and treatment.

The figures for ten years, published at page 196, show that of all diseases of the throat, nose, and ear, over one-third were the subject of aural mischief. This could be subdivided into—

Auricle and external ear	11,309
Middle ear	20,504
Internal ear	1,568

The aural lesions, with hardly an exception, which were manifested in the middle ear, and a few of those which had thence extended to the internal ear, were due to naso-pharyngeal disease; though in many instances the patient was unaware of the connection.

So much is this the case, that, without implying that deafness is present in all or even in a majority of cases of pharyngitis, tonsillitis, and naso-pharyngeal diseases, the close association is recognised as constituting a special feature in the case forms of our hospital, a reduced facsimile of which is subjoined.

Registered No. .....

CENTRAL LONDON THROAT, NOSE, AND EAR HOSPIT

Name ..... *Age* ..... *Occupation* .....

Address .....

UNDER THE CARE OF .....

NOSE..... | PH. UV. TON .....

LARYNX..... | EAR.....

Complains of.....

Onset.....

Duration.....

Voice.....

Cough.....

Respn......

Degln......

Pain.....

Headache......

Smell.....

Taste.....

Mouth and Fauces.....

Supposed Cause .....

		Right.	*After Inflation.*	Left.	*After Infl*
H.P.	*Conv.*				
	Whisper				
	Watch				
	Galton				
	Paracusis				
T.F.	*Meatus*				
	Mastoid				
	Vertex				
	Rinné				
	Discharge				
	Pain				
	Tinnitus				
	Vertigo				
	Auricle				
	Meatus				

Naso-Pharynx, Inspection .....

,, *Palpation* .....

Nose, R.....

,, L.....

Larynx.....

.....

.....

.....

Space for diagrams for indicating morbid changes (p.129)

Lungs, R.....

,, L.....

Heart.....

Remarks.....

M.T.

Mastoid.....

	PATENCY	IMPROVEMENT	PATENCY	IMPR
Valsalva ...				
Politzer ...				
Catheter ...				
	M.T.	OSSICLES	M.T.	OSS
Siegle				
Gellé	PRESSURE	SYNERGY	PRESSURE	SYN

Prescription. TREATMENT. *Notes of Progress and Treatm*

Date.		*Date.*	

It will be seen that, whilst each case-paper is arranged in two separate columns, one for the record of the condition of the pharynx, larynx, and the lower air-passages, and another for notes on the various parts of the ear, there is also *a space common to both for remarks on the condition of the naso-pharynx.*

The diseases of the pharynx and nasal passages capable of causing aural symptoms have, in a measure, been considered in their appropriate situations, and the proportions which this book has already assumed, preclude my entering at any length into the wide subject of middle-ear disease, the result or complication of naso-pharyngeal maladies.

It may be generally stated that in almost every case of obstructive deafness connected with the throat, there is an imperfect performance of the functions of the Eustachian tube in relation to the rest of the auditory apparatus. To better appreciate the importance of this fact, a few words are required to explain the **anatomical construction and physiological duties of the Eustachian tube.**

Reverting to our anatomy, reference to Figs. XVIII. (p. 36), XIX. (p. 39), and XXXVIII. and XXXIX. (pp. 58 and 59), will recall to our mind the relation of the Eustachian canal in the pharynx, whence it passes in an upward, outward, and backward direction to the middle ear.

The first points of importance to our present consideration are the position and relations of its **pharyngeal** ostium. The plates just mentioned show that the aperture is placed behind, and somewhat below, the posterior extremity of the inferior turbinal body; so that it is practically in the same horizontal plane as the inferior meatus. The aperture appears as an elliptical depression between two lips, and the anterior and lower lip is the less defined and corresponds with the *tensor palati* muscle; the posterior and upper lip is well marked, and corresponds with the *levator palati.* Behind and above the posterior lip is the *fossa of Rosenmüller*, a depression which is not unfrequently mistaken for the Eustachian orifice itself. This error will be avoided by remembrance of the fact that while the anterior lip of the tube is very shallow, that of the fossa itself is full and forms a prominent cushion of separation. The nozzle of a catheter, to be within the tube, *must therefore be in front of this ridge.*

As to the tube itself, the lumen of the inner two-thirds is slit-like, as if compressed from before backwards; this lumen is greatest at the trumpet-shaped opening into the pharynx, and narrowest at (roughly) the junction of the inner two-thirds with

the outer third; from this point—the isthmus—it widens again to expand into the tympanum. The wall of this *outer* or tympanic portion consists of bone, covered by a very thin ciliated mucous membrane, the ciliary action being towards the pharyngeal outlet. The *inner* and longer portion of the canal consists of a plate of elastic cartilage, bent upon itself; the deficiency in the wall below and somewhat in front, which increases as the pharynx is neared, is filled in by mucous membrane and fibro-muscular structures. The trumpet-shaped opening into the pharynx is seen on section to be bounded behind, above, and partially in front by a hook-shaped scroll of cartilage; the upper and posterior portions being fixed to the base of the skull, and the anterior hook being slightly movable. Below the hook, anteriorly and inferiorly, the tube is completed by membrane. It is only at the pharyngeal orifice and at the isthmus that this membrano-cartilaginous part of the tube is normally patent; in the intermediate area the mucous surfaces are in contact, so that the practically obliterated lumen forms an S-shaped slit. This arrangement is of importance in regulating the supply of air to the tympanum, for it is a potential valve which is only released by action of the muscle that is inserted into the membranous wall, and into the hook-like portion of cartilage. This muscle, which is commonly called the *tensor palati*, but, as Von Tröltsch suggests, might more properly be denominated the *dilatator tubæ*, has little or no action on the soft palate; but during the process of swallowing it presses on the membranous portion of the tube and on the hook-like scroll, widening the lumen by its direct influence on the former, and by tending to unroll the latter.

Many authors ascribe an equally important function to the *levator palati*; but as it is situated almost parallel to the membranous wall, its only effect is to force the floor upwards and backwards. Acting alone, it would tend to compress the tube and obliterate its lumen by its contracting belly heaving the floor up, so to speak. This consideration led Politzer and Cleland to deny its dilating function altogether; but, for my part, I think that, *in conjunction* with the *tensor palati* (*dilatator tubæ*), the upward movement of the *levator* must tend to an increase of the transverse diameter of the passage. It is doubtless, however, principally a palatal muscle.

The *salpingo-pharyngeus* plays no very important part in the human species. It is only exceptionally present, more rarely bilateral, and its representation in a degraded form as a strip of

fascia is not even constant. When muscular, it would contribute only to the fixed position of the median portion of the cartilage.

During the act of swallowing, the Eustachian tube is rendered patent by the co-operation of the before-mentioned muscles, and it is thus that intra-tympanic pressure is regulated.

Politzer draws attention to the important fact that 'the Eustachian canal in the child differs considerably, as regards length, width, and direction, from the adult. Its tympanic orifice is comparatively large, and lies somewhat lower; on the other hand, the pharyngeal orifice is indicated only by a slight depression or fissure, and the posterior (usually prominent) position of the tube forms a hardly noticeable projection in the wall of the pharynx. The tube in the child is also shorter and wider, a condition which is of practical importance, in so far as obstacles in it caused by the products of disease can with greater facility be removed by a current of air.'

For perfect hearing, it is essential that there should be free ventilation of the tympanum through the Eustachian tube, and that the mouth of this canal should be freely opened by muscular action at certain times. All conditions which tend to narrow the lumen by swelling of the mucous membrane, or which hamper the action of the muscles, will prevent the equilibration of intra-tympanic pressure, and also the escape of secretion, thus inevitably leading to middle-ear disease and its sequelæ.

Non-specific catarrhal affections of the neighbouring mucous membrane often bring about the same condition.

The chief naso-pharyngeal maladies of this nature are:

I. **Rhinitis** in both its **acute** and **chronic** (**Hypertrophic**) forms, **Hypertrophic rhinitis.** Either may act injuriously on the hearing in a three-fold direction:—(*a*) Mechanically, by direct closure; (*b*) pneumatically; (*c*) by catarrhal extension.

II. **Atrophic rhinitis,** in which there is destruction of cilia by the backward extension of inflammation from the nose and its accessory sinuses, leading to a similar condition of the Eustachian orifice, and eventually (also by extension) to dry catarrh of the tube and tympanum.

III. **Growths** in the naso-pharynx inducing Eustachian obstruction, either by contact with the orifice, or by the induced catarrh of the neighbouring mucous membrane. Under this category come *adenoid growths*,

naso-pharyngeal tumours, *polypoid hypertrophy* of the posterior extremities of the turbinated bodies, and true *nasal polypi*, which may project into the naso-pharyngeal space.

In addition to the foregoing, which either directly block the Eustachian orifice by mechanical obstruction, or indirectly by inducing an extension of the catarrhal process, there are other conditions which, if of long standing, lead to Eustachian obstruction by impeding the action of the muscles which open the mouth of the tube. Under this heading are included:

IV. **Enlargements of the tonsils,** whether benign or malignant. Tonsillar hypertrophy never directly obstructs the Eustachian orifice, but by its frequent upward extension the palate is pushed up, and the action of the muscles thereby markedly impeded. It must also be remembered that there is nearly always associated catarrhal *naso-pharyngitis*; and in the young, up to the ages of 15 or 20, there will frequently be concomitant *adenoid hypertrophy* of the pharyngeal tonsil, and occasionally catarrh of Luschka's pouch (*Tornwaldt's disease*).

V. **Enlargements of the palate,** whether of the nature of a *gumma*, *hæmatoma*, *abscess* (*suppurative peritonsillitis*), or *neoplasm*, occasionally give rise to Eustachian and middle-ear disease. Under this head may be also considered *deformities*, congenital and acquired.

VI. **Paralysis,** *diphtherial* or *bulbar*, is sometimes attended by Eustachian blocking. Under this head may be also included the defective muscular arrangements of *cleft palate*, congenital or acquired; also *alar paresis* and *collapse*.

Various **specific diseases** which affect the throat may extend to the tube and tympanum.

VII. Under this heading are included *scarlet fever*, *measles*, *small-pox*, *diphtheria*, and less frequently, in an acute form, *pneumonia*, *glanders*, *insanitary sore throat*, and *phlegmonous erysipelas*.

The effects of *syphilitic* extension along the Eustachian tube are seldom of an acute nature or suppurative, being for the most part sclerotic. *Tubercle* acts also subacutely and slowly; when manifested, it often leads to disintegration of the membrane, and is then the cause of a purulent discharge.

Finally, in this connection may be mentioned middle-ear trouble, due to the *forcing* of *mucus* or of infective matter into a very patent tube. This exceptionally occurs in *whooping-cough*, *persistent vomiting*, and unskilful or excessive catheterization. Temporary inconvenience is sometimes caused by coughing, sneezing, and a *trumpeting* mode of blowing the nose. It is a question whether in *pertussis*, which is now generally considered a bacillary disease, and of which otorrhœa is a frequent sequel, morbific germs may not enter the middle ear by the Eustachian tube during a paroxysm of coughing.

The Eustachian orifices have occasionally been injured by *traumatism*, *careless adenoid removal*, *caustic poisons*, and *scalding fluids*. These rare accidents are more liable to happen in connection with cleft palate.

The conditions, then, capable of causing so-called throat deafness are many and varied, and so, it may be added, are the results.

The first stage, as before mentioned, is usually hypertrophic catarrh and blocking of the tube; this may lead to either mucoid, serous, or suppurative catarrh of the tympanum. The latter may go on to acute inflammation, perforation, chronic otorrhœa, granulations, polypi, exostoses, etc.; labyrinthine disease, with associated tinnitus and vertigo, or to mastoid abscess, and even intra-cranial suppuration.

TREATMENT.—Only the broadest hints can be given.

That of **chronic non-suppurative catarrh** of the middle ear consists, in the first place, in removing the diseased state which originally brought about the Eustachian malady. The appropriate treatment of these exciting nasal and naso-pharyngeal diseases has been discussed under the sections dealing with the primary conditions. The ear trouble itself requires early and active attention.

The chief indications in non-suppurative catarrh, in addition to removal of the naso-pharyngeal malady, are:

I. To open up the Eustachian communication between the tympanum and the pharynx, that the secretions may escape, and that equilibrium between intra-tympanic pressure and that of the external air may be restored.

II. To treat the diseased lining membrane of the tube and tympanum, and bring it back as near as is possible to the normal.

III. By general dietetic and hygienic measures to diminish any diathetic predisponent to catarrh.

As regards the first indication, namely, mechanically opening up the Eustachian tube by means of a blast of air, the simplest

also a box into which iodine, chloroform, menthol, or other drug, sprinkled on wool, can be introduced, and thus the Eustachian tube can be medicated as well as inflated by the one process. The first variety of inflating bag is preferable for the patient's self-use; the second, for that of the surgeon.

If inflation is unsuccessful by Politzer's method, recourse must be had to the *Eustachian catheter*. When this is in position in the Eustachian orifice, an air-bag is connected directly or indirectly by rubber tubing with the wide end; a blast of air is easily forced into the tube in most instances. This method is often described as painless; but it is, to say the least, decidedly and universally unpleasant. Frequent catheterisation may in any case do harm by irritation of the Eustachian orifice, and in the hands of unskilful persons actual injury may result. In other circumstances this simple irritation has the effect of stimulating a paretic *dilatator tubæ* to healthy contraction. After the passage has been opened up in this way, it is usually possible to keep it patent by systematic Politzeration, a treatment which the patient may be taught to practise for himself. In my own experience catheterisation is rarely necessary or desirable more than once a week or fortnight. In many cases where nasal stenosis has been rectified, the Eustachian catheter, which was previously essential for tympanic inflation, may be dispensed with, the Politzer bag being then all-sufficient.

FIG. CCCCXVI.—AUTHOR'S FORM OF POLITZER BAG.

FIG. CCCCXVII.—KEENE'S FORM OF POLITZER BAG.

As regards the application of fluids to the lining membrane of the Eustachian tube and tympanum, by means of injection through the catheter or otherwise, I have long held objections to the practice as one which is painful, dangerous, and in most cases useless; and I find it difficult to too emphatically condemn it in cases of non-suppurative catarrh, uncomplicated by perforation of the membrana tympani. This opinion has been so general, that

the practice is nowadays almost entirely confined to the injection of a few drops of Paroleine in cases of dry catarrh with closed tube; and for this it is an efficient remedy.

It is necessary to repeat that, combined with these measures, and as a rule preceding them, the greatest attention must be given to the condition of the throat, and to improvement of the pharyngeal and nasal secretions by inhalations, lozenges, local applications, and by the posterior nasal douche. This last measure is immensely preferable to the anterior, for the reason that fluid is less likely to enter the Eustachian tube and tympanum.

Suppurative Catarrh of the middle ear is usually presented to the specialist in the chronic stage with perforation of the tympanic membrane. Acute suppuration may occur in the course of certain throat complications of the specific fevers, as scarlet fever, measles, and diphtheria, or occasionally as a traumatic result of galvano-cautery to the nasal passages, or as an accident after bathing. Whatever the cause, anodyne ear-drops of belladonna and opium not only relieve pain, but often prevent an acute median otitis from proceeding to suppuration. The membrane should always be carefully inspected, whenever, in the course of acute throat diseases, ear-ache is complained of, and so soon as there is distinct evidence of acute suppuration, the membrane should be artificially perforated, and gentle soothing medication only pursued. It is to be noted that while an incised membrane almost always heals, such a result is, to say the least, doubtful if it is allowed to rupture. Cassells therefore justly gave the name of 'Conservative Aural Surgery' to the course here recommended.

Chronic cases may be treated on the same lines as the non-suppurative as regards the Eustachian orifice, but we may now go further, and inject sprays and medicated solutions by Politzer or by the catheter in obstinate conditions. Whilst treatment by way of the Eustachian orifice is being pursued, the tympanic disease must also be energetically attacked through the meatus. This passage should always be washed out with warm water, or mild antiseptic lotions, before the application of detergent or astringent drops.

The tube should always be freed after syringing, either by Politzer's or other mode of inflation; and finally, treatment should aim at preventing retention of discharge; for extension to the *mastoid cells, meninges, and brain* often result from the opposite practice of too strong astringents or detergents, and hence the traditional objection to *stopping* a discharge from the ears.

FORMULÆ FOR REMEDIES.

THE formulæ are arranged mainly in the order in which they are considered in Chapter IX., on 'Therapeutics,' and most of them are to be found in the Pharmacopœia of the Central London Throat, Nose, and Ear Hospital.

GARGARISMATA—GARGLES.

Preferably employed as mouth-washes or with the throat syringe. All the prescriptions are for 10 fluid ounces.

1. Gargarisma Acidi Acetici.

℞ Acidi Acetici . . . . . fl. ʒijss.
Glycerini . . . . . fl. ʒiij.
Aquam . . . . . ad fl. ℥x.

Misce.

Use.—Antiseptic and stimulating when inflammatory throat affections complicate the exanthemata.

2. Gargarisma Acidi Carbolici.

℞ Glycerini Acidi Carbolici . . . . fl. ʒj ad ʒij.
Aquam . . . . . ad fl. ℥x.

Misce.

Use.—Stimulant and antiseptic. Useful in cases of pharyngitis sicca, and all forms of ulceration; also, diluted with warm water, as a mouth-wash in tonsillitis.

3. Gargarisma Acidi Sulphurosi.

℞ Acidi Sulphurosi . . . . . fl. ℥ss ad ℥j.
Aquam . . . . . ad fl. ℥x.

Use.—Considered by some authors as almost specific in diphtheria, but employed by me in pseudo-diphtherial inflammations and in mycosis.

4. Gargarisma Acidi Tannici et Gallici.

℞ Acidi Tannici . . . . . gr. 360.
Acidi Gallici . . . . . gr. 120.
Aquæ . . . . . fl. ʒj.

Misce.

The object of the preparation is, that it should be a thick mixture rather than a solution, as it would become on standing. It should therefore be made fresh as required, and in a large tumbler, although the amount of water employed is only an ounce, since the powders occupy considerable bulk.

Use.—Styptic, in case of hæmorrhage after excision of the tonsils or ablation of the uvula; the patient being directed to slowly sip the fluid for some seconds or minutes in succession.

5. Gargarisma Aluminis cum Acido Tannico.

℞ Aluminis }
Acidi Tannici } . . . . . āā gr. 60.
Aquæ Rosæ . . . . . fl. ℥x.

Misce.

Use.—Astringent in ordinary relaxation and congestion of the fauces.

6. Gargarisma Boracis.

℞ Glycerini Boracis . . . . . fl. ℥ss ad ℥jss.
Aquam . . . . . ad fl. ℥x.

Misce.

Use.—Mildly alkaline and astringent.

7. Gargarisma Hydrargyri Biniodidi.

℞ Hydrargyri Iodidi Rubri . . . . gr. 2½.
Sodii Iodidi . . . . . gr. 2½.
Aquam . . . . . ad fl. ℥x.

Misce.

(This represents a strength of 1 in 2000.)

Use.—Stimulant in syphilitic ulceration of the pharynx. To be used rather as a mouth-wash than as a gargle. Diluted with equal or twice the quantity of water—that is, 1 to 4000 and 6000 respectively; useful with spray or throat syringe in diphtheria, etc.

8. Gargarisma Potassii Chloratis.

℞ Potassii Chloratis . . . . gr. 90 ad gr. 120.
Glycerini . . . . . fl. ℥ij.
Aquam . . . . . ad fl. ℥x.

Misce.

Use.—Antiseptic. Especially useful as a mouth-wash in syphilis during administration of mercury.

9. Gargarisma Potassii Permanganatis.

℞ Liquoris Potassii Permanganatis . . (B.P.) fl. ℥j.
Aquam destillatam . . . . . ad fl. ℥x.

Misce.

Use.—Antiseptic. In the same proportions, but at a temperature of 90° to 95° F.; this gargle may be used as a nasal douche.

10. Gargarisma Sodii Sulphatis.

℞ Sodii Sulphatis	. . . . .	gr. 240.
Aquam	. . . . .	ad fl. ℥x.

Misce.

Use.—In suppurative inflammations of the throat, after the abscess has been opened; may be preferably used warm and with the syringe. As a solvent of pus, this preparation is preferred for irrigation in the case of all purulent discharges.

11. Gargarisma 'Sanitas.'

℞ 'Sanitas'	. . . . .	fl. ℥ss.
Aquam	. . . . .	ad fl. ℥x.

Misce.

Use.—Antiseptic, or as in the formula No. 9 for a nasal douche.

TROCHISCI—LOZENGES.

12. Trochisci Astringentes Effervescentes.

These were made, at my suggestion, by Mr. Cooper of Oxford Street (see *British Medical Journal*, 24th Jan. 1874). Each lozenge contains 1 gr. of Eucalyptus and a small quantity of Powdered Squill, combined with the ingredients of Cooper's well-known effervescing lozenge.

Use.—Astringent and sialagogue. Most useful as voice lozenges. One, or a portion of one, should be taken before use of voice.

13. Trochisci Antimonialis Compositi Effervescentes.

These lozenges, also made by Cooper, contain in each ½ a grain of Grey Powder and ⅛ grain each of Tartar Emetic and of Peroxide of Iron.

Use.—In secondary syphilis, for the better attainment of both local and constitutional effect.

14. Trochisci Eucalypti Compositi (Corbyn).

Each lozenge contains 2 grains of Chlorate of Potash, 1 grain of Extract of Eucalyptus Rostrata, ¼ grain of Powdered Cubebs, with acid fruit paste, and is marked C. E.

Use.—Originally prescribed and largely employed by me for the joint astringent, sialagogue, and expectorant action of the various ingredients; and preferable to many lozenges containing but one active agent.

15. Trochisci Salini Astringentes.

These lozenges were made to my prescription by Roberts of Bond Street, as a substitute for the above in those cases in which the fruit paste produces disorder of digestion. Each lozenge contains 2 grains of Chlorate of Sodium, 1 grain of Extract of Eucalyptus Rostrata, ¼ grain of Extract of Cubebs, with a basis of Liquorice and Glyco-gelatine.

Use.—The same as the foregoing.

16. **Trochisci Expectorantes** (Roberts).

Each lozenge contains $\frac{1}{20}$ grain of Ipecacuanha, with a basis of Gly gelatine.

Use.—As indicated by the title.

17. **Trochisci Guaiaci.**

Each lozenge contains 2 grains of Guaiacum, and is marked G.

Use.—In acute inflammation of the tonsils and fauces, and generally 'soreness' of throat, especially such as is associated with rheumatism.

18. **Trochisci Menthol** (Christy).

Each lozenge contains $\frac{1}{4}$ of a grain of Menthol.

Use.—Stimulant, antiseptic, and analgesic. Prescribed in all forms tonsillitis.

19. **Trochisci Mentho-Eucalyptol** (Roberts).

Use.—Stimulant and astringent. A good voice lozenge. Useful most forms of pharyngitis, and especially in tonsillitis and all forms of s throat suspected of insanitary origin.

20. **Trochisci Morphinæ et Ipecacuanhæ, B.P.**

Each lozenge contains $\frac{1}{36}$ grain of Hydrochlorate of Morphia a $\frac{1}{12}$ grain of Ipecacuanha.

Use.—For allaying irritable cough, and assisting expectoration laryngeal and bronchial catarrh.

21. **Trochisci Sedativi** (Roberts).

Each lozenge contains $\frac{1}{10}$ grain of Extract of Opium, with Gly gelatine.

22. **Trochisci Ammonii Chloridi c. Borace** (Roberts).

Each lozenge contains $2\frac{1}{2}$ grains of Chloride of Ammonium and Borax, and is mixed with Liquorice and Glyco-gelatine, the former of wh effectually masks the taste of the Ammonia Salt.

Use.—Valuable as a voice lozenge and as a resolvent of catarrhal c gestion of the pharynx.

23. **Trochisci Ammonii Bromidi Compositi** (Bullock).

Each lozenge contains 2 grains of Bromide of Ammonium and $\frac{1}{10}$ gr of Indian Hemp, in a basis of Liquorice and Glyco-gelatine.

Use.—Sedative for reflex coughs and neurosal irritation.

24. **Trochisci Cocainæ** (Roberts).

Each lozenge contains $\frac{1}{10}$ grain of Hydrochlorate of Cocaine, w Glyco-gelatine basis.

Use.—In diseases of the throat of a painful nature, and as a lo anæsthetic previous to examinations and operations. Also as an analge after uvulotomy, etc.

25. **Trochisci Eucainæ.**

Each lozenge contains $\frac{1}{10}$ grain of Eucaine.

Use.—Similar to Cocaine.

26. **Trochisci Codeinæ** (Savory and Moore).

Each lozenge contains $\frac{1}{6}$ of a grain of Codeia, with Saffron and Glycogelatine.

Use.—Sedative; especially useful to allay the cough of phthisis.

VAPORES—INHALATIONS.

STEAM INHALATIONS.

27. **Vapor Benzoini.**

℞ Tincturæ Benzoini Compositæ . . . . fl. ʒiij.

A teaspoonful in a pint of water at 130° to 150° F. for each inhalation.

Use.—A valuable sedative in acute inflammations of pharynx and larynx.

28. **Vapor Benzoini c. Chloroformo.**

℞ Tincturæ Benzoini Compositæ . . . . fl. ʒiij.
Chloroformi . . . . . ♏ xxv.
Misce.

A teaspoonful in a pint of water at 140° F. for each inhalation.

Use.—Sedative.

29. **Vapor Benzoini c. Oleo Pini Sylvestris.**

℞ Tincturæ Benzoini Compositæ . . . fl. ʒxxij.
Olei Pini Sylvestris . . . . . fl. ʒij.
Misce.

A teaspoonful in a pint of water at 140° F. for each inhalation.

Use.—Mildly stimulant. Of service in superficial forms of inflammation of the pharynx or larynx.

30. **Vapor Benzol.**

℞ Benzol . . . . . fl. ʒij.
Olei Cassiæ . . . . . ♏ vj.
Magnesii Carbonatis Levis . . . gr. 60.
Aquam . . . . . ad fl. ʒiij.
Misce.

A teaspoonful in a pint of water at 140° F. for each inhalation.

Use.—Similar to Benzoin, but rather more stimulating. Employed in hospital practice on account of the lessened cost.

31. **Vapor Benzol c. Aldehydo.**

℞ Aldehydi . . . . . fl. ʒss.
Vaporem Benzoli . . . . . ad fl. ʒiij.
Misce.

A teaspoonful in a pint of water at 140 F. for each inhalation.

Use.—Mildly stimulant. The Aldehyde is indicated in cases o arrested mucous secretion.

32. Vapor Creasoti.

℞ Creasoti . . . . . fl. ℥ss.
Magnesii Carbonatis Levis . . . . gr. 90.
Aquam . . . . . ad fl. ℥iij.

Misce.

A teaspoonful in a pint of water at 140° F. for each inhalation.

Use.—Stimulant, in chronic congestion of the larynx and in ozæna.

33. Vapor Creasoti c. Chloroformo.

As above, with one drop of chloroform to the fluid drachm.

34. Vapor Eucalypti.

℞ Olei Eucalypti . . . . . fl. ℥j ad ℥iij.
Magnesii Carbonatis Levis . . gr. 30 ad gr. 90.
Aquam . . . . . ad fl. ℥iij.

Use.—An agreeable stimulant, with sedative effect in laryngeal inflam mation of a subacute character.

35. Vapor Lupuli.

℞ Sodii Carbonatis Exsiccatæ . . . . gr. 20.
Aquæ (140° F.) . . . . . fl. ℥xx.

Solve et adde.

Extracti Lupuli . . . . . gr. 60.

The vapour to be inhaled.

Use.—Sedative. Especially useful in laryngeal phthisis and cancer.

The vapour of Oil of Hops, as recommended in the *Throat Hospital Pharmacopœia*, is very irritating, and far from sedative. Although inconvenient on account of its bulk, the old inhalation prepared by macerating hops in hot water was much more soothing.

36. Vapor Terebenæ.

℞ Terebenæ Puræ . . . . . fl. ℥ij.
Magnesii Carbonatis Levis . . . . gr. 60.
Aquam . . . . . ad fl. ℥iij.

Misce.

Use.—Sedative and antiseptic in phthisis, and a mild stimulant in catarrhal laryngitis, tracheitis, and bronchitis.

37. Vapor Pini Sylvestris.

℞ Olei Pini Sylvestris . . . . . fl. ℥ij.
Magnesii Carbonatis Levis . . . . gr. 60.
Aquam . . . . . ad fl. ℥iij.

Misce.

A teaspoonful in a pint of water at 140° F. for each inhalation.

Use.—A mild but useful stimulant and resolvent.

38. **Vapor Pini Sylvestris c. Camphorâ.**

Fiat ut supra cum Camphorâ . . . . . gr. 5.

Use.—More stimulant than the foregoing.

NOTE.—Any of the above may be used with Lee's Steam Draught Inhaler.

COLD INHALATIONS.

These refer chiefly to those of the vapour of Neutral Chloride of Ammonium, which is only now employed by me as a medium for the essential oils. Most of those which are applicable for steam inhalations may be dissolved in spirit and added to the water-chamber through which the nascent ammonia passes. In this connection I also employ Ozonic Ether, and the following is a type of a formula for this class of inhalation:

39.

℞ Olei Eucalypti }
Olei Pini Sylvestris } . . . . . āā fl. ʒj.
Etheris Ozonici }
Spiritûs Vini Rectificati } . . . . . āā fl. ʒxj.

Misce.

A teaspoonful to be added to the water-chamber of the neutral ammonia inhaler.

Use.—Serviceable as a stimulant to promote secretion in chronic catarrhal inflammations of the pharyngeal and naso-pharyngeal passages. The Ozonic Ether relieves spasmodic dyspnœa in cases of laryngeal stenosis, etc.

NEBULÆ—ATOMISED FLUID INHALATIONS.

These are chiefly recommended for pharyngeal and nasal diseases.

The amount prescribed is the maximum to be used for any one inhalation. A less quantity is often sufficient.

40. **Nebula Acidi Carbolici.**

℞ Acidi Carbolici . . . . . gr. 3.
Aquæ destillatæ . . . . . fl. ʒj.

Solve.

Use.—Stimulant and antiseptic, where there is deficient mucous secretion; it is also sedative.

41. **Nebula Acidi Lactici.**

℞ Acidi Lactici . . . . . fl. ʒj. ad fl. ʒij.
Aquam destillatam . . . . . fl. ʒj.

Misce.

Use.—Of great service in diphtheria; it appears to have the effect of dissolving the membranous exudation, and is employed by me to the

43. **Nebula Antipyrin.**

℞ Antipyrin . . . . . .
Aquam . . . . . .

Use.—Sedative, and of some repute as a hæmostatic.

44. **Nebula Calcis.**

℞ Liquoris Calcis, *q.s.*

Use.—Of some repute as a resolvent in diphtheria.

45. **Nebula Cocainæ.**

℞ Cocainæ Hydrochloratis . . . gr. 25. a
Aquæ . . . . . .

Misce.

Use.—As local anæsthetic, to be employed for a few s subsequent to operations on the throat or nose. In the l better to apply pledgets of absorbent wool soaked wit solution inside the nostrils, there to be retained for t minutes.

46. **Nebula Eucainæ.**

This is made in the same way as the foregoing, and, slower in action, is without risk of toxic effects. On accoun solubility, it is necessary to employ it in weaker strength 5 per cent. being the maximum.

Use.—Sedative.

47. **Nebula Zinci Sulpho-Carbolatis.**

℞ Zinci Sulpho-carbolatis . . . . .
Aquæ destillatæ . . . . . .

Misce.

Use.—Astringent and antiseptic.

FUMING INHALATIONS.

The ordinary method of employing these inhalations is t

useful addition in the way of drugs containing volatile principles are, Eucalyptus, Santal, and Stramonium.

Another form of fuming inhalation is that of sublimed calomel, as figured and described at page 154.

DRY INHALATIONS.

These preparations are employed by me in connection with Oro-nasal inhalers, and are indicated in cases of phthisis, dry hot inhalations being generally impracticable.

The following are types :—

48. **Vapor Siccus** (Coghill).

℞ Tincturæ Iodi
Acidi Carbolici
Creasoti (vel Thymol)
Etheris Sulphurici . . . . . āā ℥ij.

Misce.

Use.—Stimulant and antiseptic. This is the form recommended by Dr. Sinclair Coghill.

49. **Vapor Siccus** (L.B.)

℞ Creasoti . . . . . fl. ℥ss.
Olei Pini Sylvestris
Olei Eucalypti . . . . . āā ℥j.
Tincturæ Benzoini Co. . . . . ℥ij.

Misce.

Use.—Stimulant, but less likely to provoke cough than the previous one.

NOTE.—The vapours of Pine Oil, Eucalyptus Oil, and Pure Terebene can also be inhaled, uncombined, either from the oral-nasal inhaler or from a piece of lint, or Menthol from the Gossypium Menthol of Bullock & Co.

PIGMENTA—FLUIDS FOR EXTERNAL AND INTERNAL APPLICATION.

A. EXTERNAL.

50. **Liquor Epispasticus, B.P.**

51. **Linimentum et Tinctura Iodi, B.P.**

52. **Linimentum Sinapis Compositum, B.P.**

53. **Pigmentum Chloral c. Camphorâ.**

℞ Camphoræ (reduced to fine powder with a few drops of rectified spirit)
Chloral Hydratis . . . . . āā ℥ss.

Misce bene.

54. **Pigmentum Acidi Carbolici.**

15 grs. to 30 grs. in the ounce of distilled water.

55. **Pigmentum Acidi Lactici.**

Equal parts of the ingredient and distilled water.

Use.—In diphtheria. This solution is much stronger ordinarily recommended. (See Formula 41.) This solutio employed for the treatment of ulcerations of tuberculosis and curettage; and again as an application after scraping of the sinus, etc.

56. **Pigmentum Aluminii Chloridi.**

10 grs. to 30 grs. to the fluid ounce of distilled water.

57. **Pigmentum Argenti Nitratis.**

10 grs. to 60 grs. to the fluid ounce of distilled water.

58. **Pigmentum Cupri Sulphatis.**

10 grs. to 20 grs. in the fluid ounce of distilled water.

59. **Pigmentum Ferri Perchloridi.**

20 grs. to 90 grs. in the fluid ounce of distilled water.

60. **Pigmentum Guaiacol.**

℞ Guaiacol . . . . . fl. ℥
Ol. Amygdalæ Dulcis . . . . . fl. ℥

Use.—Stimulant and analgesic; of powerful effect to red inflammations and to relieve pain. It is employed also as a nebu pharynx, or, with intra-laryngeal syringe, to the larynx and trache of laryngeal and pulmonary tuberculosis.

62. Pigmentum Iodoformi vel Iodol, etc.

℞ Iodoformi vel Iodol, Aristol, etc. . . . ℥j.
Ætheris Communis . . . . . ad fl. ℥j.

Use.—Dissolve by adding the Iodoform or Iodol gradually to the Ether with frequent shaking. Useful in reducing naso-pharyngeal congestions and in granular pharyngitis. The Iodol is preferable to the Iodoform, on account of the smell, but is hardly so active in effect. It is also used as a spray.

63. Pigmentum Löffler.

℞ Menthol . . . . . 10 parts.
Toluol . . . . . 26 „
Solution of Perchloride of Iron (Fort.) . . 4 „
Absolute Alcohol, *q.s.* to make . . . 100 „
Misce.

Use.—Recommended by Löffler as specific for diphtheria: preferably employed by me for pseudo-diphtherial or coccal forms of sore throat.

64. Pigmentum Menthol (Rosenberg).

This consists of a mixture of 20 parts of Menthol with 80 of Olive Oil, liquid Vaseline, or odourless Paraffin Oil. It is useful as a spray for pharyngeal inflammations; and is amongst the most recent topical applications recommended for *laryngeal tuberculosis*, and may be applied by either brush or spray. It is also useful for reducing hyperæmia of the turbinate bodies.

65. Pigmentum Zinci Chloridi.

10 grs. to 30 grs. in the ounce of distilled water.

66. Pigmentum Zinci Chloridi c. Morphinâ.

℞ Zinci Chloridi . . . . . gr. 10 to gr. 30.
Morphinæ Hydrochloratis . . . . gr. 4.
Glycerini } . . . . . āā fl. ℥ss.
Aquæ destillatæ }
Misce.

Use.—In ulcerations of the larynx accompanied with pain. Requires to be used with caution, on account of the morphia.

NOTE.—Morphia gr. 1, or Cocaine gr. 5, to the fluid ounce, may be added to either the copper, iron, or zinc solutions.

67. Pigmentum Ovi Vitelli.

℞ Tincturæ Benzoini Compositæ }
Tincturæ Camphoræ Compositæ } . . . āā ℥j.
Tincturæ Belladonnæ . . . . . ℥j.
Misce et adde Vitellum Ovi unum.

Insufflations are used by me in only a modified degree, in number to the following :—

68. Insufflatio Zinci Chloridi.

℞ Zinci Chloridi . . . . . .
Bismuthi Oxy-chloridum . . . . . .
Misce.

Use.—Astringent and resolvent.

69. Insufflatio Zinci Chloridi c. Morphiæ Hydrochl

℞ Zinci Chloridi }
Morphiæ Hydrochloratis } . . . . . ā
Bismuthi Oxy-chloridum . . . . . .
Misce.

Use.—Astringent and sedative, especially for relief of cou phthisis.

70. Insufflatio Iodoformi vel Iodol, etc.

℞ Iodoformi vel Iodol, Aristol, etc. . . . .
Bismuthi Oxy-chloridum . . . . .
Misce.

Use.—Much recommended in cases of tuberculous or s tion, but not largely employed in my own practice in larynge

71. Insufflatio Cocainæ Hydrochloratis.

℞ Cocainæ Hydrochloratis . . . . gr. 5 ad
Bismuthi Oxy-chloridum . . . . . .
Misce.

Use.—Sedative, and serviceable prior to attempts at swall of pain in cancer and laryngeal phthisis ; also in the acute fever, or of a common head cold.

72. Insufflatio Menthol Comp.

This consists of a mixture—to be used as a nasal snuff, or

COLLUNARIA—NASAL DOUCHES.

These preparations may be used with either the anterior or posterior nasal douche. Ten ounces will usually be found a sufficient quantity to use at one time for the **anterior douche**, and a pint should never be exceeded. I employ, as a rule, an **anterior nasal syringe** containing two ounces, which is passed first through one nostril and then the other. The syringe for the **posterior douche** holds four ounces, and about two syringes full are usually to be employed on each occasion of administration. In the use of the anterior nasal douche on the siphon principle, the vessel containing the fluid should not be placed much above the patient's head, or the current will descend with too great force. In cases of post-nasal catarrh, and in cases in which use of the anterior nasal douche seems to cause aural trouble, or where there is a more than usually tenacious secretion requiring removal, the posterior nasal douche will be found superior to the anterior.

For **nasal irrigation** in ozæna and other diseases of accessory sinuses, fully a quart, as recommended by Moure, is of service, but it is seldom recommended by me except for administration by surgeon or nurse.

Many of these formulæ are also useful for oral, pharyngeal, and faucial washes, by means of the **Throat syringe,** and with but slight modification for the **Ear.**

All nasal douches should be used at a temperature of 95° F.

73. Collunarium Acidi Carbolici.

℞ Glycerini Acidi Carbolici . . . . . fl. ℥j.
Aquam tepidam . . . . . ad fl. ℥x.

Use.—Antiseptic and detergent.

74. Collunarium Boracis.

℞ Glycerini Boracis . . . . fl. ℥ss ad fl. ℥x.

Use.—Sedative and antiseptic.

75. Collunarium Chinosol ($C_6H_9N.KSO$).

Solutions of 15 grains in two quarts of water (1 : 2400) serve as a gargle, and the same amount in 1 quart (1 : 1200), or in 1 pint of water (1 : 600), may be used for nasal douches and antiseptic irrigations; for this purpose Chinosol may be associated with Alum. For painting diseased tissues, a mixture of 5 parts Chinosol powder in 20 parts of Glycerine and 10 parts of water is recommended. It has been employed by me with advantage, in this method, for malignant and specific ulceration of the pharynx.

76. Collunarium Potassii Permanganatis.

℞ Liquoris Potassii Permanganatis . fl. ℥j ad fl. ℥x.

Use.—Detergent.

'Sanitas' . . . . . fl. ʒij to ʒiv ad

Use.—Antiseptic and detergent.

79. **Collunarium Zinci Sulpho-carbolatis.**

Zinci Sulpho-carbolatis . . . . gr. 20 ad

Use.—Antiseptic.

80. **Collunarium Potassii Chloratis Compositum.**

℞ Potassii Chloratis
Sodii Bicarbonatis } . . . . . a
Boracis
Sacchari Albi . . . . . .

Misce.

Directions.—Dissolve a teaspoonful in 5 to 10 ounces 95° F. for each douche.

N.B.—To these formulæ may be added the nasal tabloids, which is almost legion, made by Burroughs & Wellcome. Those now by me are the Alkaline and Antiseptic of Carl Seiler, and the Eucalyptia (B. & W.)

81. (80A on p. 155). **Lotio Iodi.**

℞ Tincturæ Iodi . . . . . .
Glycerine . . . . . .
Aquam . . . . . a

Misce.

Use.—This lotion is for application by wet compress, as in the text, p. 155.

UNGUENTA—OINTMENTS.

Ordinary ointments for external applications are not given. The first of the following prescriptions, which is in use at the C

82. **Unguentum Hydrargyri c. Belladonnâ.**

℞ Extracti Belladonnæ . . . . . ℥j.
Unguentum Hydrargyri }
Unguentum Iodi } . . . . . āā ℥ss.

Misce.

THE FOLLOWING ARE ALL FOR NASAL APPLICATION.

83. **Unguentum Eucalypti.**

℞ Olei Eucalypti . . . . . ♏ xx. ad fl. ℥j.
Vaselinum vel Lanolinum . . . . . ad ℥j.

Misce.

Use.—Antiseptic; employed for keeping the mucous membrane moist in cases of dry catarrh.

84. **Unguentum Hydrargyri Compositum.**

℞ Unguenti Hydrargyri Nitratis Mitius }
Unguenti Hydrargyri Oxidi Rubri } . . āā ℥ss.
Vaselinum vel Lanolinum . . . . . ad ℥j.

Misce.

Use.—Detergent in cases of syphilitic ulceration, and generally to stimulate healing after operations on the septum nasi, etc.

85. **Unguentum Iodol.**

℞ Iodol . . . . . gr. 10 to gr. 25.
Vaselinum vel Lanolin . . . . . ad ℥j.

Carefully triturate the Iodol, and mix.

Use.—Antiseptic. This preparation has superseded that of iodoform, formerly recommended.

86. **Unguentum Cocainæ Hydrochloratis c. Eucalypto.**

℞ Cocainæ Hydrochloratis . . . . . gr. 5.
Olei Eucalypti . . . . . ♏ xx. ad fl. ℥j.
Vaselinum vel Lanolinum . . . . . ad ℥j.

Misce.

Use.—Beneficial in nasal cases dependent on hyperæmic hypertrophy of the turbinated bones, also in nasal polypus after operation; also as a preventive of sneezing, and as allaying many of the symptoms of hay-asthma.

N.B.—Inadvisable for long-continued use.

MISTURÆ—MIXTURES.

87. **Mistura Aconiti.**

℞ Tincturæ Aconiti . . . . . ♏ xv.
Aquam . . . . . ad fl. ℥ij.

Misce.

A teaspoonful for a dose, representing about one minim of the tincture to be given every quarter of an hour for four doses; then every half-hour for four doses; then every hour, two hours, etc., the intervals being increased as the skin becomes moist, and the heart's action lowered.

Use.—Of great value in reducing temperature and pulse in early stages of inflammatory affections, tonsillitis, etc.

88. **Mistura Ammonii Chloridi c. Sodii Iodido.**

℞ Ammonii Chloridi	gr. 20.
Sodii Iodidi	gr. 3.
Ext. Glycyrrh. Liq.	♏ xx.
Aquam	ad fl. ℥j.

Misce.

Use.—In chronic naso-pharyngitis associated with middle-ear inflammation and tinnitus. Preferably taken at 11 a.m. and 4 p.m., *i.e.* between meals.

89. **Mistura Belladonnæ c. Opio.**

℞ Tincturæ Belladonnæ Tincturæ Opii	āā ♏ v.
Aquam Camphoræ	ad fl. ℥j.

Misce.

Use.—In catarrhal conditions causing coryza. Will often arrest a cold in the head if commenced on first approach of symptoms. For this purpose it should be taken *between* meals, say at 11 a.m. and 4 p.m.

90. **Mistura Expectorans Tonica.**

℞ Ammoniæ Carbonatis	♏ ii. ad ℥iv.
Tincturæ Scillæ	♏ x.
Tincturæ Digitalis	♏ v.
Liq. Strychniæ	♏ ij.
Infusum Carcarillæ	ad fl. ℥j.

Misce.

Use.—A good expectorant mixture in subacute catarrh of larynx, etc.

*** The Digitalis may often be omitted.

91. **Mistura Hydrargyri Biniodidi.**

℞ Hydrargyri Perchloridi	gr. 1.
Potassii vel Sodii Iodidi	gr. 60.
Decocti Sarzæ Compositi (Concent.)	fl. ℥iv.

Misce.

Dose.—Each teaspoonful contains $\frac{1}{3^{\frac{1}{2}}}$ grain of active ingredient. One to two teaspoonfuls thrice daily.

Use.—In tertiary syphilis.

In private practice I find the preparation known as *Sirop de Gibert*, which contains $\frac{1}{6}$ of a grain of Biniodide of Mercury and 8 grains of Iodide of Potassium with Syrup in each tablespoonful, a useful and 'elegant' mode of administering this drug.

92. Mistura Sodii Salicylatis Composita.

℞ Sodii Salicylatis	gr. 10 ad gr. 25.
Sodii Chloratis	gr. 5 ad gr. 8.
Spiritus Chloroformi	♏ x.
Decoctum Cinchonæ	ad fl. ℥j.

Misce.

Dose.—Every hour or two until pain is relieved, when the dose is to be diminished and the intervals of administration lengthened. To this mixture Sulphate of Magnesia may sometimes be usefully added.

Use.—In tonsillitis, where there is simultaneous general rheumatism with hyperpyrexia; also in all throat inflammations accompanied by pain.

93. Mistura Terebenæ.

℞ Terebenæ Puræ	♏ v. ad ♏ x.
Pulveris Tragacanthi Compositi	gr. 5.
Aquam Chloroformi	ad fl. ℥j.

Misce.

Use.—Sedative, expectorant, and antiseptic. Useful in subacute and chronic laryngeal catarrh.

94. Mistura Hypophosphitium Composita.

℞ Sodii Hypophosphitis, Calcii Hypophosphitis	āā gr. 5.
Infusi Quassiæ	fl. ℥j.

Misce.

Use.—This is the ordinary tonic prescribed at hospital for phthisis. It is varied by addition of Strychnia or Arsenic; and sometimes the Compound Syrup of the Hypophosphites is substituted.

PILULÆ—PILLS.

95. Pilula Expectorans.

℞ Pilulæ Scillæ Compositæ	gr. 4.
Pulveris Doveri	gr. 2.
Pilulæ Rhei Compositæ	gr. 3.

M.; ft. pil. ij.—Two pills to be given night and morning, and, if necessary, one or two also at intervals in the day.

Use.—These pills, which are very similar to some well known as prescribed by the late Dr. Billing, are most valuable in cases of loss of singing voice and simple catarrhal causes.

96. **Pilula pro Dyspepsiâ.**

℞ Quiniæ Sulphatis
Acidi Carbolici } . . . . . āā gr. ½.
Extracti Rhei
Pepsinæ Porci (Bullock's) . . . . . gr. 2½.
Misce. Fiat pilula.

Dose.—One before each meal at which meat is taken.

Use.—Valuable in sluggish digestions with flatulence, and especially serviceable for vocalists, actors, and all speakers in whom the digestive function is frequently impeded by nervousness.

VARIÆ—VARIOUS.

97. **Anti-catarrhal Smelling Salts.**

℞ Acidi Carbolici . . . . . gr. 30.
Ammoniæ Carbonatis . . . . . ℥j.
Pulveris Carbonis Ligni . . . . . ℥j.
Olei Lavandulæ . . . . . ♏ xx.
Tincturæ Benzoini Compositæ . . . . fl. ℥ss.
Misce.

The above mixture was made as the result of analysis of a well-known patent remedy for colds in the head, and is very efficacious in certain catarrhal conditions of the naso-pharynx.

TRITURATES.

This new form of dispensing potent remedies generally consists of the medicine which has been triturated with Sugar of Milk, until a thorough and complete division and equal distribution of it has been made throughout the mixture; it is then made into a soluble paste with varying proportions of alcohol and water, and afterwards moulded into tablets of exactly the same size and weight.

The success which has attended the introduction of this method of dispensing medicine which is given in small quantities, is due mainly to the thoroughness of division of the remedy, and the perfect accuracy of the dose.

The following, all of them imported by Roberts from Frazer of New York, are those most generally prescribed in my practice:—

98. Aconite . . . . Tincture Aconite, ♏ 1.

99. Antimonium c. Ipecacuanhâ { Tartar Emetic, $\frac{1}{100}$ gr. / Ipecacuanha, $\frac{1}{100}$ gr.

Most useful in initial stages of laryngeal and tracheal inflammations. Administer at very short intervals (five to ten minutes) until expectoration is free or physiological nausea induced.

100. Atropinæ Sulphate . . $\frac{1}{100}$ gr.
One or two for a dose in night sweats of phthisis.

101. Calomel . . . . . ½ gr.

One or two for a dose.

102. Cannabis Indica . . . . $\frac{1}{20}$ gr.

103. Hydrargyri Iodidi Comp. . { Red Iodide of Mercury, $\frac{1}{32}$ gr. / Ipecacuanha, ⅛ gr.

104. Rhinitis (Lincoln) . . . { Camphor, ¼ gr. / Extract Belladonna, ⅛ gr. / Quinine Sulphate, ¼ gr.

Excellent for arresting head colds: the first six doses should be taken at very short intervals—five to ten minutes; then less frequently.

105. Zinci Phosphidi c. Nuce Vomicâ . . { Zinc Phosphide, $\frac{1}{10}$ gr. with Extract of Nux Vomica, ¼ gr.

STAINING SOLUTIONS FOR DETECTING DIPHTHERIA BACILLI.

Löffler s Solution (Squire).

℞ Concentrated Alcoholic Solution of Methylene-Blue 30 parts.
Solution of Caustic Potash (1 in 10,000 of Water) 100 „

Misce.

Place cover-glasses in this solution for three to five minutes, wash, dehydrate, clear, and mount in balsam.

Roux's Double Stain.

℞ Dahlia or Gentian-Violet . . . . . 0.5 grm.
Methyl-Green . . . . . 0.5 „
Distilled Water . . . . . 200 c.c.

Mix, and filter before use.

Sections are placed in this stain for twelve hours, then washed, dehydrated, cleared, and mounted.

Gram's Method (Squire).

Place section in the following solution:—

Aniline Water . . . . . 100 parts.
Concentrated Solution of Gentian-Violet . 11 „
Absolute Alcohol . . . . . 10 „

For one to three minutes. Rinse in absolute alcohol, and transfer to Gram's solution:—

Iodine . . . . . 1 part.
Iodide of Potash . . . . . 2 parts.
Distilled Water . . . . . 300 „

Until they acquire a brown colour; this takes place in about one to three minutes. The sections are then washed in 90 per cent. alcohol, until they are a pale yellow colour, dehydrated, cleared, and mounted in balsam.

THE ZIEHL-NEELSEN STAIN, FOR DETECTIN TUBERCLE BACILLI.

Having heated to coagulation a thin layer of sputum on a cover-g warm a small quantity of the following solution (No. 1), and pour it the specimen (which is laid in a shallow bath or saucer):—

No. 1.

℞ Fuchsin	1 grm.
Carbolic Acid	5 c.c.
Alcohol	10 ,,
Distilled Water	100 ,,

Let it remain three to ten minutes, and then wash in a 25 per dilution of sulphuric acid until decolorised. Wash quickly and thorou with water so as to remove all acid, transfer to another bath, and pou the following solution (No. 2) for counter-staining:—

No. 2.

℞ Methylene-Blue	2 grms.
Distilled Water	100 c.c.

Let it remain one minute, wash in tap-water, dry, and mount in Z balsam.

While the time required is so short that this process is in that res equal to any of the other so-called 'quick' methods, it has also advantage that it is more permanent, and with slight modificatio applicable to tissue specimens.

PLATES.

THE Illustrations are so arranged that they can be studied during perusal of the text, referring to them without the inconvenience of constantly turning the leaves.

For this purpose it is necessary only to unfold the Plate, and it will then lie beside the letterpress for reference during perusal of the Chapter to which they pertain.

A short description of each figure is given on the page corresponding to the Illustration.

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XV.	The Lymphatic Vessels of the Base of the Tongue, Tonsils, Larynx, and Pharynx—Photo-lithograph (*after Sappey*)	130

FIG. 1 represents the appearance, so far as form is c
typical larynx in the act of deep inspiration; and Fig. 2 in
phonation. The other figures illustrate variations in c
different portions. (Pages 98 to 104.)

As stated in the text, no attempt has been made at colo
this Plate or in Plate XIV., since the tint of mucous membr
individuals is as various in grade as is the complexion of th

A.C.—Anterior Commissure of the Vocal Cords.
L.G.E.F.—Lateral Glosso-Epiglottic Fold.
S.G.E.F. (Fig. 7).—Superior Glosso-Epiglottic Fold.
T.E.F. (Fig. 2).—Thyro-Epiglottic Fold.
P.E.F.—Pharyngo-Epiglottic Fold.
A.E.F.—Ary-Epiglottic Fold.
S.S.E.—Superior Surface of Epiglottis.
I.S.E.—Inferior Surface of Epiglottis.
C.E.—Cushion of Epiglottis.
L.E.—Lip or Free Edge of Epiglottis.
V.B.—Ventricular Bands—formerly called False Vo
V.M. (Figs. 1 and 6).—Ventricle of Morgagni.
F.I.—Fossa Innominata.
C.W.—Cartilage of Wrisberg.
C.S.—Capitulum of Santorini.
I.A.F.—Inter-Arytenoid Fold.
P.C.—Posterior Commissure of the Vocal Cords.
V.C.—Vocal Cords.
V.P. (Fig. 2).—Vocal Process.
C.C.—Cricoid Cartilage.
T.—Trachea.
R.B.—Right Bronchus.
L.B.—Left Bronchus.
H.F. (Fig. 2).—Hyoid Fossa.
C.H.—Cornu of Hyoid Bone.

PLATE II.

Diseases of the Fauces and Pharynx.

Fig. 12.—Acute inflammation of the fauces and pharynx. (Page 248.)

Fig. 13.—Unilateral acute faucitis (strepto and staphylo-coccal). (Case related on page 251 as No. VII.)

Fig. 14.—Subacute inflammation of fauces, occurring in a gentleman, æt. 42, of arthritic diathesis, and prone to excess in stimulants and tobacco-smoking. (Page 260.)

Fig. 15.—Pharyngitis sicca. (Page 264.)

Fig. 16.—Chronic pharyngitis, with venous congestion and glandular hypertrophy, occurring in a professional vocalist (tenor), æt. 26. The varicose veins were intercepted at five points by galvano-caustic application (October 18, 1877). The granular condition at once subsided, and the patient regained his singing voice. (Page 261 *et seq.*)

Fig. 17.—A similar condition, of much longer standing, occurring in a lady's maid, æt. 35, much occupied with reading aloud. Cured by similar treatment, February 1877. Was known to have remained well in the following November. (Page 261 *et seq.*)

Fig. 18.—Fauces with perforation between the pillars on the right side, a condition sometimes congenital or as the result of scarlet fever. In this instance, scars on left side point to a syphilitic origin. (Pages 283 and 305.)

Fig. 19.—Secondary outgrowth from velum, the result of tertiary ulceration. That on the right of the centre line is the true uvula considerably relaxed. (Page 282.)

PLATE III.

Syphilitic Disease of the Pharynx.

Fig. 20.—Secondary congestion and mucous patches on velum and uvula; drawn from a female, æt. 23, married five years, and having a healthy child nine months old. Primary infection probably five or six months previously. (Page 273 *et seq.*)

Fig. 21.—Secondary congestive patches with two small symmetrical condylomata at edge of posterior pillars; drawn October 18, 1877, from a female patient, æt. 21. Squamous eruption on skin. Primary disease probably six or eight months previously. (Page 273 *et seq.*)

Fig. 22.—Secondary congestion with characteristic raised mucous patches on fauces and tonsils; drawn September 24, 1871, from a married female patient, æt. 28. (Page 273 *et seq.*)

Fig. 23.—A typical case of secondary congestion with strikingly symmetrical mucous patches; drawn February 1874, from a male patient, W. W., æt. 23, who had been primarily infected six months previously. (Page 273 *et seq.*)

Fig. 24.—Tertiary ulceration of right side of pharynx and velum, and of posterior wall of pharynx; drawn from H. F., an engine-driver, æt. 27, who had been primarily infected three and a half years previously. (Page 278 *et seq.*) In this patient there was also paralysis of the abductor of the left vocal cord.

Fig. 25.—Active tertiary ulceration of posterior pharyngeal wall, with old cicatrices and cicatricial outgrowth; drawn from Catherine P., æt. 41, who had suffered from sore throat for more than seven years. (Page 278.)

Fig. 26.—Old perforating ulcers of velum and of right side of pharynx, with cicatricial outgrowth in the latter situation. The puckered condition of the velum around the central perforation well illustrates nature's attempt to close off the passage to the posterior nares. (Page 278.) The laryngeal condition of this patient, Edward F., æt. 53, is delineated in Fig. 82, Plate IX.

Fig. 27.—Congenital tertiary ulceration; taken from a female patient, æt. 11, November 1878. (Case XVII., page 284.)

PLATE IV.

Diseases of the Uvula and Tonsils.

Fig. 28.—Acute œdema of uvula. (Page 312.)

Fig. 29.—Chronic inflammation of uvula with relaxed mucous membrane, which is seen to be slightly bifurcated. (Page 313.) Drawn from W. P., æt. 31, painter, July 11, 1877.

Fig. 30.—Warty growth attached by long membranous pedicle to uvula, and causing severe dyspnœa; removed December 4, 1876, with immediate relief. (Case XXV., page 322.)

Fig. 31.—Inflammation and slough on uvula, drawn from a patient, Kate G., aged 19, seen at hospital February 3, 1879. Had experienced pain in eating some pie four days previously, and had had pain ever since. The trouble subsided under salicylates, and the sucking of ice in small pieces. (Page 313.)

Fig. 32.—Traumatic membranous inflammation and hæmorrhagic extravasation of the uvula. Case was that of C. B., æt. 46, a carpenter, who applied at the hospital on the same day as last case, stating that he had experienced pain in swallowing a piece of crust of bread at dinner the previous day, and found the rest of the meal painful. Was not in very good health at the time, and had had shiverings two or three days previously. The case was successfully treated by measures similar to the previous one. (Page 313.)

Fig. 33.—Acute inflammation, with œdema of left tonsil (peri-tonsillitis) and of uvula, occurring in a gentleman, æt. 22; drawn November 26, 1876. The parents of this patient were first cousins, and the darthous diathesis was strongly evidenced on both sides. The case was treated by aperients with colchicum, and suppuration was arrested. (Page 313.)

Fig. 34.—Acute desquamative tonsillitis (quinsy). The drawing represents the appearance on the fourth day. The uvula is seen characteristically lying on the swollen gland. (Page 339.)

Fig. 35.—Chronic scrofulous hypertrophy of tonsils, occurring in a lad, æt. 17, sent for operation by Dr. Dobell. The uvula is also relaxed and rather nodular. (Page 348.)

Fig. 36.—Chronic inflammatory hypertrophy of tonsils, the result of repeated attacks (twelve) of quinsy; occurring in a male patient, æt. 31. (Page 348.)

PLATE V.

BENIGN AND MALIGNANT DISEASE OF UVULA AND TONSILS.

Fig. 37.—Primary epithelioma of the uvula. (Case XXVII., page 322.)

Fig. 38.—Primary epithelioma of the soft palate. (Case XXVIII., page 323.)

Fig. 39.—Angioma of soft palate and uvula. (Case XXVI., page 322.)

FIG. 40.—The same on forcible ex-spiration.

Fig. 41.—Syphilitic ulceration of the palate and fauces in a scrofulous patient. (Case XVIII., page 288.)

Fig. 42.—Lympho-sarcoma of the tonsil. (Case XLVIII., page 379.)

Fig. 43.—Carcinoma of tongue invading left tonsil. (Case XL., page 370.)

Fig. 44.—Primary epithelioma of left tonsil. (Case XLVII., page 378.)

PLATE VI.

Diseases of the Lingual Tonsil.

Fig. 45.—This drawing shows the occasional appearance of the lingual tonsil as continuous with the faucial. (Page 385.)

Fig. 46.—Varix of the lingual tonsil in the person of a medical man. (Case LVIII., page 404.)

Fig. 47.—Chronic hypertrophy of the lingual tonsil and varix, from the engineer of a steamer, æt. 50, sent to me by Dr. Weakley of Forest Gate.

Fig. 48.—Lymphoma of the lingual tonsil. (Case LX., page 410.)

Fig. 49.—Chronic hypertrophy of the lingual tonsil and varix. (Case LIII., page 401.)

Fig. 50.—Mixed growth of lingual tonsil. (Case LXI., page 410.)

Fig. 51.—Lupus of larynx involving lingual tonsil. (Case CXX., page 629.)

Fig. 52. — Primary epithelioma of lingual tonsil. (Case LXIII., page 411.)

Fig. 53 and 54.—Sarcoma of left faucial tonsil, lingual tonsil, and larynx. (Case CLX., page 689.)

PLATE VII.

Diphtheria and other Infectious Diseases of the Throat.

(Chapter XXI., page 491 *et seq.*)

Fig. 55.—Diphtheria of the tonsils and uvula.

Fig. 56.—Diphtherial laryngitis (croup) in the same patient. (Page 528.)

Fig. 57.—Diphtheria of the posterior nares in the same patient. (Page 510.)

Fig. 58.—Faucial diphtheria of the 'creeping' type, pronounced on the left tonsil, less so on the right, in a female child, æt. 8, on the third day of the disease. (Page 513.)

Fig. 59.—Diphtheria of the fauces, 'hæmorrhagic' form, in a male child, æt. 8, on the third day of the disease. (Page 513.)

Fig. 60.—Diphtheria of the fauces, the 'emplastered' form, in a female child, æt. 5, on the third day of the disease. (Page 513.)

Fig. 61.—Subacute pharyngitis with pustular eruption of varicella, in a young lady, æt. 20, seen October 15, 1877, in consultation with Mr Henry Bullock. (Page 515.)

Fig. 62.—The fauces in a case of scarlet fever occurring in a female child, æt. 10. (Page 514.)

Fig. 63.—Pseudo-diphtheria with exudation on fauces and uvula, in a female, æt. 40. Culture showed almost pure growth of staphylococcus (Page 515.)

Fig. 64.—Fauces of a patient suffering from advanced alcoholism notified as diphtheria. Culture demonstrated a growth of diplococcus and fragments of a large fungus.

PLATE XIII.

Benign and Malignant New Formations in the Larynx.

(Chapters XXVI. and XXVII., pages 645 to 710.)

Fig. 109.—Fibro-cellular polypus situated beneath the vocal cords, with some general congestion of the larynx. The growth was removed by means of Gibb's snare, December 5, 1876, from E. A., æt. 22, married, without children, and engaged as an artificial flower maker. After the operation she regained her voice, which had been quite lost for six months. There was a history of syphilis in this case.

Fig. 110.—Papilloma situated in the inter-arytenoid fold, above the level of the vocal cords, and not therefore interfering, except quite occasionally, with the voice. The drawing was taken from a patient, æt. 26, an actor who had contracted syphilis four years previously, and who suffered from irritable cough, but pursued, and still pursues, his vocation.

Fig. 111.—Papilloma on the left vocal cord, interfering greatly with the voice, which varied from hoarseness to complete aphonia. This growth was removed by Jellenfy's instrument from a male patient, a hawker, æt. 32.

Fig. 112.—Mucous polypus attached by very fine pedicle to the right vocal cord of a bass singer, æt. 30, the patient of Dr. Llewellyn Thomas, who kindly sent him to the author for inspection. The peculiarity of this case was that the growth did not in the least interfere with the singing voice, and the patient was engaged twice daily in choir work. In ex-spiration the growth rested on the superior surface of the vocal cord (*a*), and in deep inspiration could be drawn quite beneath it and out of sight. With quick respiratory movements the polypus could be seen to flap to and fro (*b*). Dr. Thomas successfully dislodged it by friction with a laryngeal brush.

Fig. 113.—Symmetrical papillomata in Case CXXXIV., of Mr. T. J., with syphilitic history. (Page 653.)

Fig. 114.—Papillomata growing from left ventricle and from under-surface of right vocal cord, with mucous polypi on under-surface of epiglottis and on left ventricular band. The majority of the growths were removed by tube-forceps, and a great improvement resulted, when the patient, a man, æt. 38, who had already visited other hospitals, ceased attendance.

Fig. 115.—Fibroma on left vocal cord causing hoarseness in a female patient, a hawker, æt. 38. Applications of astringents (principally iron) were of service in this case, but operative treatment was declined.

Fig. 116.—This drawing is a replica of one figured by the author in Mackenzie's work on Growths in the Larynx, and is there described as an adenoma. The growth, which was removed by Dr. Mackenzie, 'was exhibited by him at the Pathological Society (*Transactions*, vol. xxi.), and referred for investigation to the Morbid Growth Committee. The Sub-Committee appointed to examine the specimen considered it a case of "adenoid carcinoma"; but the report was not confirmed by the full committee, and does not appear in the *Transactions*.' It is, however, interesting to add that the patient, in whose case there was also distinct syphilitic history, died of malignant ulceration of the larynx, commencing at the seat of the tumour. The case is here inserted, as it well serves to illustrate the author's fifth proposition at page 662.

Fig. 117.—Pharyngo-laryngeal epithelioma commencing in the left lingual tonsil and extending to the glosso-epiglottic and pharyngo-epiglottic fold; and thence invading the larynx. Necrosis of the cartilages has already commenced. Male patient, æt. 58.

Fig. 118.—The same disease, distorting the epiglottis and pushing the larynx out of the median line. Male patient, æt. 63.

Fig. 119.—The same disease, commencing in the hyoid fossa. The left vocal cord is seen to be paralysed. Male patient, æt. 60.

Fig. 120.—Lympho-sarcoma of the larynx, occurring in a female patient, æt. 47. The disease had been diagnosed by another practitioner six months previously. This drawing was made in March 1877, very shortly before death. The case is described as CLXI., at page 692, and the post-mortem appearance is also depicted at page 674.

(Chapter XXVIII., page 711.)

Fig. 121.—Bilateral paralysis of adductors (crico-aryt and arytenoideus). Appearance in attempted phonation.

Fig. 122.—Unilateral paralysis of adductors of left co in attempted phonation. (Page 753.)

Fig. 123.—Bilateral paralysis of abductors (crico-aryt Appearance with deep inspiratory effort. (Page 756.)

Fig. 124.—Unilateral paralysis of left abductor. App inspiration. The affected cord is seen to be in the ca (Page 755.)

Fig. 125.—Appearance of normal larynx after dea 'cadaveric' position of the vocal cords; this is also their quiet respiration.

Fig. 126.—The same condition as Fig. 124. Appea tion; the right cord is seen to come beyond the median li is found in the cadaveric position. (Page 755.)

Fig. 127.—Bilateral paralysis of the sphincter of th arytenoidei). (Page 757.)

Fig. 128.—Bilateral paralysis of the arytenoideus. (Pa

Fig. 129.—Bilateral paralysis of the thyro-arytenoide the arytenoideus. (Page 757.)

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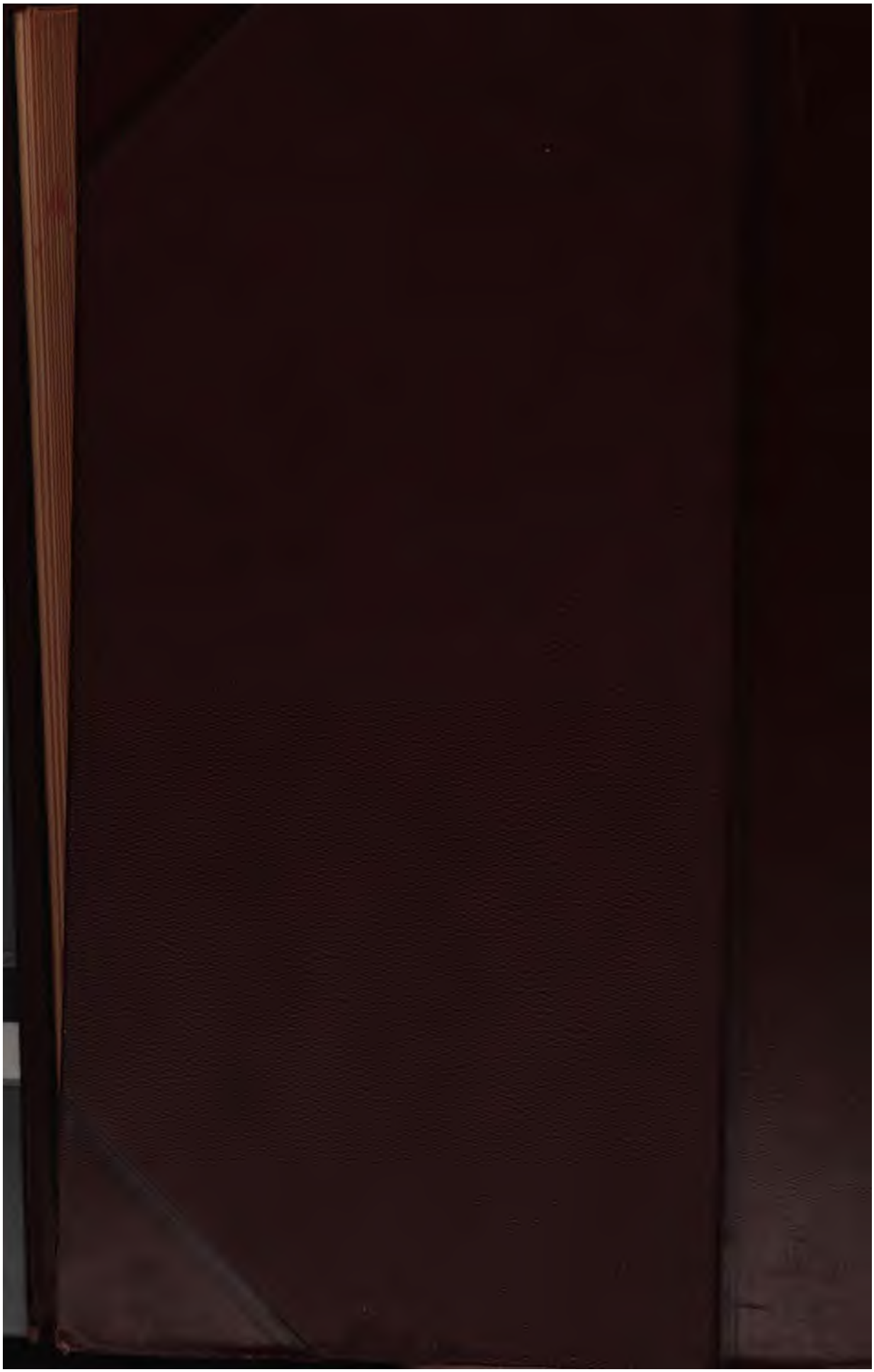
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